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BEFORE THE

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SCIENCE, TECHNOLOGY, AND SPACE

OF THE

COMMITTEE ON COMMERCE,
SCIENCE, AND TRANSPORTATION
UNITED STATES SENATE

NINETY-NINTH CONGRESS

SECOND SESSION

ON

AUTHORIZATION FOR NATIONAL BUREAU OF STANDARDS

APRIL 10, 1986

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NATIONAL BUREAU OF STANDARDS AUTHORIZATION

THURSDAY, APRIL 10, 1986

U.S. SENATE
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION
SUBCOMMITTEE ON SCIENCE, TECHNOLOGY, AND SPACE
Washington, D.C.

The subcommittee met at 9:35 a.m. in Room SR-253, Russell, Senate Office Building, Hon. Slade Gorton [chairman of the subcommittee] presiding.

Staff members assigned to this hearing: Charles Faust, professional staff member and Patrick Windham, minority professional staff member

OPENING STATEMENT BY SENATOR GORTON

Senator GORTON. Good morning and welcome to this hearing before the Senate Commerce Committee's Subcommittee on Science, Technology, and Space. We are here to discuss fiscal year 1987 funding for the Department of Commerce's National Bureau of Standards, Office of Productivity, Technology, and Innovation, and National Technical Information Service.

The subcommittee has the unenviable task of attempting to balance rigid budgetary constraints with our desire to provide the strong commitment to science and technology necessary to make American industry competitive internationally in rapidly evolving high technology fields.

We are concerned that the basic science and research programs may be subject to disproportionate budget reductions because many other Federal programs, notably entitlements and those critical to national security, cannot be cut sufficiently to alleviate our deficit problem.

Unfortunately, the budgetary difficulties in science and technology come at a time when the nation needs strong research and technological advancement. We are experiencing record trade deficits and our competitive position in high technology trade, an area in which we historically have been dominant, is eroding in the face of increasing foreign competition.

Indeed, one could argue that a reduction in Federal scientific research to reduce the deficit could actually increase the deficit by harming American industry. Clearly, the Congress must work harder than ever to ensure that our Federal budget in the areas of science and technology creates substantial economic benefit without compromising our effort to balance the budget by 1991.

In this context, we will discuss the administration's proposed budgets for these important Department of Commerce programs. The National Bureau of Standards is the only Federal laboratory directed specifically to serve the needs of U.S. industry and science. The Bureau provides measurements, standards, reference materials, and technical information with broad applications in engineering, electronics, chemistry, and computer sciences, to name a few.

The importance of the Bureau's programs can be seen in the number of private companies and universities which, often at their own expense, send scientists and engineers to conduct research at the Bureau.

The administration has requested a fiscal year 1987 budget for the Bureau of about $124 million. This figure is virtually identical to the Bureau's 1986 budget, before reductions pursuant to the Balanced Budget and Emergency Deficit Control Act, but several significant changes have been proposed.

The administration requests a $10 million increase to begin construction of a cold neutron research facility at the Bureau. This facility would be used for precise measurement of the properties of advanced materials, and would have applications in many branches of materials research. Today we will discuss the costs and benefits associated with the cold neutron facility.

As in recent years, the administration has proposed to eliminate the Bureau's Center for Building Technology and Center for Fire Research. The Center for Building Technology provides valuable research in structural engineering and building materials, and the Center for Fire Research studies the physical properties of fire and dynamics of fire within structures.

This morning we will discuss the potential effects of eliminating these centers and the possibility that their services could be assumed by states or by the private sector, as the administration suggests.

The Bureau's Institute for Computer Sciences and Technology has also been targeted for major reductions. The administration has proposed to terminate ICST's work with industry on interface and storage media standards and high performance computing.

We will discuss the proposed reductions in ICST's budget and also ICST's role in monitoring a voluntary standards process undertaken by the industry. In addition to these major reductions, we will examine other proposed reductions and some prospective initiatives for which no funding has been requested.

The administration has proposed, as it did last year, to phase out the Office of Productivity, Technology, and Innovation. It argues that this office has concluded its mission and that its work can be performed by other agencies and by the private sector. OPTI helps small businesses improve productivity, advises state and local governments on technological development, and includes the Office of Metric Programs, the Office of Strategic Resources, and the National Technical Information Service.

OPTI also coordinates Federal technology transfer programs and Federal patent policy. This function is especially important to the committee. Last month we reported legislation improving technology transfer and amending the Stevenson-Wydler Act, which assigns several functions to OPTI.

The National Technical Information Service is the source of Federal scientific and technical documents. It licenses patents for some agencies and houses the Center for the Utilization of Federal Technology, an entity created by the Stevenson-Wydler Technology Innovation Act of 1982 to improve the transfer of inventions ouf of the Federal laboratories.

We understand that the administration has ordered NTIS to study a proposal to turn its functions over to the private sector. We will be interested in hearing about this proposal.

I have opening statements from Senators Hollings, Riegle, and Rockefeller which I will insert in the record.

[The statements follow:]

OPENING STATEMENT BY SENATOR HOLLINGS

Mr. Chairman, once again we face a year of tight budgets and important needs. Unnecessary government spending must be reduced. However, as I have said before, we are not serving America well if we cut sound and essential investments in our nation's economic health and public safety.

Once again, the Administration proposes to eliminate the Center for Fire Research (CFR) and Center for Building Technology (CBT) at the National Bureau of Standards. If the states and private sector could or would take over this important research, then I would consider the proposal.

But to propose eliminating these centers without presenting any credible substitute is, in my view, totally unacceptable. The per capita fire death rate in this country remains among the highest in the industrialized world. The fire center's work with smoke detectors and fire-resistant carpets and upholstery have done much to reduce that death rate; more research can cut it further. The building center continues to be the federal government's principal site for, among other things, research on designing earthquake-resistant structures. My hometown of Charleston, South Carolina, suffered a disastrous earthquake a century ago this year. Today, as then, collapsing buildings cause many earthquake deaths and injuries. To abdicate this work without an alternative means of carrying it out is irresponsible.

I am interested in the proposal to transfer some of NBS's computer networking research to a new private organization, the Corporation for Open Systems. To be acceptable, any such proposal must guarantee objectivity, neutrality among companies, and openness. The federal government must also remain involved, particularly in government-to-government negotiations of international standards. I congratulate NBS for exploring this kind of industry-government cost-sharing, and look forward to reviewing the details of this proposal.

I also look forward to examining the proposed NBS initiatives to help the development of America's high-technology industries. By providing the measurement techniques needed to improve equality control and manufacturing, NBS plays a crucial role in improving America's lagging industrial competitiveness. As in past years, however, I oppose attempts to fund this important work on new technologies by eliminating badly-needed research on fire and building safety.

OPENING STATEMENT BY SENATOR RIEGLE

Mr. Chairman, today we are reviewing the accomplishments and proposed budgets of the Commerce Department's technology programs—the National Bureau of Standards, the Office of Productivity, Technology, and Innovation, and the National Technical Information Service.

Technology and technology programs have never been more important to our country. Technological progress has always been vital to our public welfare and national security. Today, however, the very survival of our economy also depends on innovation. As the President's own Commission on Industrial Competitiveness said over a year ago, the United States now faces an unprecedented economic and industrial challenge from foreign competitors. In a world of low-wage countries, technology is our nation's one great competitive advantage. The President's Commission put it this way: "A technology gap is required—one in favor of the United States—both to maintain our standard of living and to provide an adequate national defense."

I am particularly interested in the work of the National Bureau of Standards, the one federal laboratory whose explicit mission is to aid U.S. industry and science. By providing precise measurement techniques, NBS provides a vital role in helping industry improve quality control and manufacturing. As the President's Commission and others have noted, manufacturing technology is one area where the United States seriously lags behind Japan.

I am pleased to see that the President's budget requests an expansion of Bureau work in such important emerging technologies as ceramics and fiber optics.

I am not pleased, however, that the Administration again proposes to fund this work by eliminating two Bureau units that make important contributions to public safety—the Center for Fire Research and the Center for Building Technology. Fires kill thousands of Americans each year. Construction problems threaten many more. The public has received enormous benefits from the small investment we have made in these two centers. The fire center's success in developing reliable smoke detectors has, by itself, saved hundreds and possibly thousands of lives. The building center perfected new methods of energy conservation, savings millions of dollars in energy bills. They also do important work on protecting buildings from earthquakes. These are sound public investments that no one else has the incentive or ability to make.

I am also concerned about the Administration's proposal to abolish the Commerce Department's Office of Productivity, Technology, and Innovation (OPTI). OPTI is not the high-powered policy office that Congress envisioned when we passed the Stevenson-Wydler Technology Innovation Act in 1980. But except for an increasingly weak White House science office, OPTI is the only technology policy operation in the executive branch. At a time when technology is becoming more important to national welfare, not less, I am puzzled by the proposal to eliminate OPTI. I also want to know how the Department proposes to carry OPTI's statutory authorities if the office is abolished—statutory responsibilities in technology policy, metric policy, strategic resources, and other areas. The Administration has yet to present a credible plan on how they propose to carry out these responsibilities if OPTI goes.

Finally, there is the question of the National Technical Information Service (NTIS)—the unit that collects and disseminates technical reports from the U.S. government and foreign governments. OMB has asked NTIS to conduct a study on whether the Service should be "privatized." I will wait to comment on this idea until I see the completed report, but even now it is clear that NTIS carries out at least two functions that cannot be readily transferred to the private sector. One is its statutory responsibility to help other agencies transfer government inventions to the private sector. The other is the role NTIS now performs in negotiating government-to-government agreements on access to foreign technical documents. I want to know how Commerce plans to handle these responsibilities if NTIS is turned over to a private company.

Mr. Chairman, I look forward to working with you again this year to strengthen the Commerce Department's technology programs. They have never been more important to this nation's economy and industrial future.

OPENING STATEMENT BY SENATOR ROCKEFELLER

Mr. Chairman, as a new member of this Committee, I have spent the last year acquainting myself with the various agencies, foundations, and institutes which fall under our jurisdiction. This continuous learning experience is most valuable, not only because one can learn about their accomplishments and their frustrations, but also because one can assess their potential and the role these institutions may play in the future of our country.

I must say that there are few small agencies that have captured my imagination as quickly as the National Bureau of Standards. Since its inception more than eighty years ago, the Bureau, with its low profile and relatively small budget, has accomplished a great deal.

Indeed, there is no scientific research laboratory, hospital or manufacturing industry that does not use standards developed at the Bureau. The fact that consumers may purchase stereo components from different manufacturers and have them mesh together perfectly is due solely to standards set by this small agency.

But perhaps more importantly, the Bureau has the unique mission of serving both U.S. industry and science. In a world market where technological innovations and advances must be hurried from the laboratory bench to the production line, the Bureau's role has become invaluable in recent years.

Mr. Chairman, in this era of economic austerity, it is incumbent upon us to closely monitor expenditures and to firmly establish funding priorities. Although I am pleased to see that the budget request for the National Bureau of Standards is consistent with the Bureau's FY86 funding levels, I must express some reservations about the way these funds are to be expended.

This year's budget proposal includes some very noteworthy increases: for example, increased funding for the advanced ceramics initiative to develop new standardization procedures; a new Fiber-optics program calling for $1.7 million in expenditures; and the much needed "cold neutron facility" which is deemed of the highest priority and calls for a total of $10 million.

Moreover, I am particularly pleased with the Bureau's emphasis on advanced ceramics. I have been genuinely amazed at the recent advances in this field, particularly since I was able to see first-hand the inroads the Japanese have made in ceramics during our visit to Asia earlier this year. This is an area where the United States cannot afford to stand still and watch other countries capitalize on our hard-earned research. Experts around the world acknowledge that advanced ceramics will transform the industrial landscape of the future—affecting everything from jet engines to highway construction. It is imperative that this country compete with the Japanese and others in seeking to perfect this technology. I praise the Bureau for its ceramics initiative and fully support it.

In order to attain the FY86 funding level, however, Congress is being asked to cut not only programs we have protected in the past but also Competence Funds and support for post-doctoral fellows:

Familiar arguments are being made again this year for the elimination of the Center for Fire Research and the Center for Building Technology. Both these centers were protected from elimination in 1985 and I am confident we will do so again this year.

I have to express my strongest opposition, however, to the drastic cuts in funds for the Research Associate/Post Doctoral Program. We all know that post-doctoral fellows form the core of the new generation of research scientists Limiting the amount of fellows by reducing the financing available to recruit and support them simply does not make sense.

NBS is an institution which needs to recruit new people with innovative ideas. Cutting this program is a classic illustration of the federal government being penny wise and pound foolish. If America is to compete in the world market, if we are to produce new industries from our basic research, we must maintain a well-trained work force and foster improved relations between industry and government. I believe our commitment to the Research Associate programs must be unwavering.

Mr. Chairman, I expect this hearing will be most useful. I am certain we can work together to achieve a funding compromise with which we are all satisfied. Thank you very much.

Senator GORTON. We are pleased to have with us today several representatives from the Department of Commerce. We will hear first from Mr. Clarence Brown, Deputy Secretary of Commerce, and Dr. Ernest Ambler, Dr. Bruce Merrifield, and Mr. Joseph Caponio, the respective Directors of NBS, OPTI, and NTIS.

We will also welcome representatives of private organizations, including the National Conference of Standards Laboratories, the American Society of Testing and Materials, Boeing Computer Services, and the American Institute of Steel Construction.

We have received a number of other statements for inclusion in our hearing record and we will hold the record open for about 2 weeks after the hearing to accommodate these statements from any interested parties.

And with that, Mr. Brown, once again we welcome you. We are delighted to have you here. We would like to hear what you have to tell us.

STATEMENT OF HON. CLARENCE J. BROWN, DEPUTY SECRETARY, DEPARTMENT OF COMMERCE

Mr. BROWN. Mr. Chairman, thank you very much.

Mr. Chairman, I appreciate this chance to discuss the authorization of fiscal year 1987 appropriations for the National Bureau of Standards, the Office of Productivity and Technology Innovation, and the National Technical Information Service.

Today as never before, advances in science and technology are the key to the competitiveness of this nation, and these agencies play a key role in this endeavor. It is estimated that the world's body of scientific knowledge doubles every decade. 90 percent of all scientific knowledge has come into existence since World War II, we are told. This proliferation of knowledge is constantly producing new technology.

With the coming of low-cost telecommunications networks, engineers, scientists and business people in every part of the globe have instant access to an increasing variety and depth of information, including many of the latest technology and production techniques.

Knowledge is replacing raw materials and labor as the primary source of wealth, thus allowing nations to create their own comparative advantage and overtake more highly developed countries. In this way, Japan has threatened America as the world's leading auto manufacturer, it has replaced Germany as the world's major camera maker, and it has displaced Switzerland as the world's premier watchmaker.

It is for these reasons that this administration and the Department of Commerce in particular have given priority to improving the health of the U.S. scientific and technical enterprise.

We are all concerned with the U.S. trade position. We have not been doing well competitively in a number of product areas. But I would like to suggest that we look at more than just the negatives. This economy has seen millions of jobs created, many millions more than have been lost due to our competitors' relative successes.

Since 1982, over 9 million new jobs have been created in the United States. Between 1950 and 1970, 75 percent of all new jobs were created either by big business or government. But over the 1976 to 1982 period, their share dropped almost in half, to 38 percent. And for the most recent year for which data are available, 1984 and 1985, 90 percent of the jobs in the United States were created by firms with less than 500 employees.

Such a record suggests that we excel like no other nation when it comes to high technology product areas. Technology contributes to new products and gives existing products better performance attributes, such as higher quality and reliability. It also leads to lower production costs.

Let me put into context the importance of measurements to those industries where the application of advanced technologies is producing high rates of growth. In 1985, across the whole of the U.S. economy $200 billion was spent on measurements, or approximately five percent of the nation's GNP.

Over 40 percent of that total was concentrated in 20 sectors of the economy, including electronic components, where measurements account for 20 percent of that industry's labor costs.

I recently returned from a visit to Turkey, where I saw an automobile assembly line where the model had not changed for the last 12 years or so. At the end of the line, workmen used mallets to get doors and body parts to fit. This is where our auto industry was 20 years ago.

The key to our productivity advances was replacing labor costs—this repair after construction, if you will—with the standardization of parts that allowed us to improve the qualify control through automation and assure that the parts would all fit together without the manual labor attendant to the old process.

NBS plays the central role in developing the basis for all these measurements. The U.S. needs these measurements for new product development, efficiency, and quality assurance in manufacturing and equity in trade.

America faces the task of maintaining the strength of our technology base and focusing its use for the maximum benefit of domestic industry at a time of mounting Federal expenditures. One solution is to increase private industry involvement in the development of technology compontents. NBS has an extremely strong industry involvement, and Dr. Ernie Ambler, the NBS director, will address that in more detail in his testimony.

The Department of Commerce, like the rest of the Federal Government, has had to make some difficult choices over the past several years. We have to keep Federal spending down. Recognizing the importance of NBS to our economy, we have made every effort to provide this agency with the resources necessary to do the measurement research and standards work industry sorely needs.

In fiscal year 1987, we are asking Congress for $123,953,000. This includes increases in several key research programs in emerging technologies that are vital to U.S. trade competitiveness.

Our fiscal year 1987 budget proposal calls for $10 million to establish a cold neutron research facility adjacent to the NBS reactor. This will be a unique national research facility which is absolutely critical in advancing materials science and engineering in the United States.

We are nearly half-way through the first fiscal year in which Congress has appropriated funds for increased NBS work in advanced ceramics, and we are making good progress. This year we are requesting an increase of $783,000 to bring our spending for advanced ceramics to the $3 million level.

The fiscal year 1987 budget request of $950,000 for fiber optics will enable NBS to provide critical measurement technology and services for fiber optics components of modern communications and computer systems.

We are requesting $550,000 to enable us to improve the productivity of the Department of Commerce Consolidated Scientific Computer System. This new supercomputer, which is serving NBS, the National Oceanic and Atmospheric administration, and the National Telecommunications and Information Agency, is already operating 24 hours a day at more than 75 percent of its capacity after just 7 months of operation. But present staffing levels are adequate enough to provide only minimum user support.

The NBS fiscal year 1987 budget proposes several reductions. Both the NBS Center for Building Technology, $3.1 million, and the Center for Fire Research, $5.1 million, would be eliminated. The Federal Government has invested a total of nearly $100 million in these two programs over the past ten years, and it now is appropriate for this effort to be assumed by the private sector and state and local governments.

The NBS fiscal year 1987 budget also proposes decreases for the Institute for Computer Science and Technology, $4.7 million, recognizing that the Corporation for Open Systems, COS, will be concentrating on standards and measurements testing activities in the area of open systems interconnection.

ICST has been performing this type of research and standard setting activities for the industry in the past, and there is no reason for ICST to continue this work in light of COS' establishment.

We would terminate other research and development work in areas that could be similarly transferred to the private sector and concentrate on standards and guidelines development activities in areas that support Federal Government ADP needs.

A decrease of $1,500,000 is requested for the Technical Competence Program. This amount represents the average annual rate of turnover of projects in this program and would not result in interruption to ongoing research or separation of personnel.

A decrease of $1,641,000 is requested in the NBS' postdoctoral research program. NBS will focus its recruiting more on particular high priority programs, such as ceramics, biotechnology, and electronics, and reduce the degree to which it relies on the general recruiting mechanism of the postdoc program.

NBS has a special mission as the only Federal laboratory charged with directly serving U.S. industry. It is doing a fine job and helping this country to be more competitive by advancing measurement science and technology and providing critical services. I intend to do everything I can to make sure it continues to play that critical role in the future.

At this point, I would like to direct the committee's attention to two other important components of the Department of Commerce, the Office of Productivity, Technology, and Innovation, and the National Technical Information Service. NTIS is a vital player in the Department's efforts to encourage wider use of technology. It makes its contribution:

By serving as a clearinghouse for the collection and dissemination of government-sponsored scientific, technical, and engineering information, as well as certain information originating abroad;

And by operating the government's most active patent licensing program, through which it evaluates new technology developed at Federal laboratories, identifies inventions with commercial potential, and negotiates licenses for their use.

NTIS' clearinghouse programs are generally self-supporting. That is, they are funded through the sale of its products and services. Its patent licensing program, on the other hand, relies in part on appropriated funds. That need, however, has declined as the programs become more self-supporting.

In fiscal year 1985, we needed $543,000. In fiscal year 1986, that was down to $536,000. And for fiscal year 1987, we are requesting appropriations of $443,000.

Before leaving NTIS, I want to speak briefly about our "plan" to "privatize" it. Firms in the private sector do exist to serve consumers' information needs. Given that, and given the administration's belief that, in the absence of an overriding reason, the government should not compete with the private sector or do for it what it can do and is willing to do for itself, we have decided to take a look at whether the private sector can take over some or all of NTIS' responsibilities.

We have reached no conclusions. In fact, our studies are just in the developmental stage and probably will not be completed before September.

That brings us to OPTI. A principal mission of OPTI has been to help us identify and correct those Federal policies that have wasted resources and made it harder for new technologies to develop and grow. OPTI has performed its mission admirably, as Dr. Merrifield will describe more fully later.

It has accomplished what it set out to do. Accordingly, the administration is requesting that OPTI's fiscal year authorization be reduced from $1,805,000 to $1,510,000 in fiscal year 1987, and that the fiscal year 1987 funds be used to phase out its operations.

A small staff may be retained that will serve as a focal point and advocate with respect to policy matters involving productivity, technology, and innovation. It will assist also the private sector in forming cooperative R&D ventures, with particular emphasis on "leapfrog" technologies. And it should foster new technology-based joint ventures between U.S. and foreign firms, with special emphasis on small businesses.

Mr. Chairman, that completes my testimony and I would be delighted to answer any questions you may have.

Senator GORTON. Let us start with the Fire and Building Centers. The administration contends that the services provided by these centers should be performed by States or by the private sector. What evidence to you have that either a State or States or private entities would provide these services?

Mr. BROWN. Well, first off let me suggest, Mr. Chairman, a comparison. The National Highway Traffic Safety administration, which sets guidelines and conditions under which automobile crash tests are made and uses those results for rulemaking, spends about $250,000 annually by use of essentially private centers: the Transportation Research Center at East Liberty, OH; Calspan Corporation at Buffalo, NY; and Mobility Systems and Equipment Company of Los Angeles, CA, which also do a good deal of private testing by a relatively large industry in the United States, the automobile industry, where the safety of passengers in automobiles is important.

Now, with reference to the Fire Center, we are now spending about $5.8 million in appropriations and get reimburseable support of about $3 million. In just two segments of the industry which are served by this, the household furniture and plastic material industries, those two industries bring in about $35.1 billion a year.

It is our feeling that the $5.8 million that is currently being spent in the Federal Government would be a very small portion of the kind of research that could be done by those industries to develop standards for their products.

With reference to the building construction industry, the comparison is ever more impressive. That is a $300 billion industry in the United States. We are spending a total of $12.8 million, of which $3.9 million is appropriated funds. We think that $3.9 million could be picked up very handily by the $300 billion industry that could support R&D in this area and also support the standards that might be set for construction.

We have a previous example of something that the Bureau of Standards once was doing and has now gotten out of, and that's the National Conference on States and Building—National Conference of States on Building Codes and Standards.

NBS used to coordinate all activities among the states to develop common construction standards and develop standards and test methods for new technologies. The level of effort was about half a million dollars. The National Conference of States on Building Codes and Standards is an organization now of all the States, fostered by NBS, that now coordinates several million dollars of State activity to achieve the standards and test methods that become part of building codes.

NBS no longer provides financial support because the States have taken charge of that need on their own.

Senator GORTON. Are the States spending less or more?

Mr. BROWN. The States are spending more than NBS once spent of appropriated funds.

Senator GORTON. So the taxpayers are not saving any money?

Mr. BROWN. The taxpayers are not saving any money, but the Federal Government, which is an institution which is in considerable debt, is saving money. And the States, which generally have surpluses now, seem to be able to afford that activity.

Senator GORTON. Are there any companies, either in the building technology field or doing fire research, that are remotely comparable to General Motors? Are those not highly decentralized industries, as opposed to industries with a handful of manufacturers?

Mr. BROWN. I am not sure I understand your question, Mr. Chairman. Are you talking about——

Senator GORTON. I am talking about fire research and building technology. Now, you made the analogy to traffic safety, where obviously standards have got to be made. In automobiles there are three, maybe four, domestic manufacturers and some foreign manufacturers. Is that the case in those other two areas, or are we talking about hundreds or thousands?

Mr. BROWN. You obviously have decentralized activities, but you have very large, centralized institutional organizations, such as the Associated General Contractors or the National Association of Home Builders, which would have been able to organize that kind of an effort at the $3.8 million level.

Senator GORTON. That gets to my central point. You gave me a very good answer, but it wasn't an answer to the question I asked.

The question I asked was whether or not there was any evidence that States or private entities would provide these services. You told me that there was a capacity because there were large businesses. I will now again ask, is there any evidence that States or private entities would provide these services?

Mr. BROWN. Mr. Chairman, I would suggest that we have, for instance, in the fire research area, some eight universities which are undertaking fire research. These are universities that apparently are having some of their functions financed by private activity.

In the building area, the figure is even more impressive. There are about 50 universities which are conducting research in building technology, valued at about $25.4 million. $15 million is devoted to earthquake and energy conservation concerns, and this is obviously being financed to a degree out of the private sector.

Senator GORTON. In both cases, those centers provide perhaps the bulk of their work on a reimburseable basis. Is it your view that those reimburseable services could be provided at comparable costs by other entities?

Mr. BROWN. Again, Mr. Chairman, I am not sure I understand your question. If you are asking if services could be provided on a reimburseable basis, the answer is clearly yes.

Senator GORTON. Those that are under the Department of Commerce now are providing services on a reimburseable basis, are they not?

Mr. BROWN. Yes, they are.

Senator GORTON. Are they providing them in an inefficient manner? Could those same services be provided on a reimburseable basis by the States or by universities more efficiently and at lower cost?

Mr. BROWN. We think that is true, yes, sir.

Senator GORTON. So you think that these two centers which are now under your jurisdiction operate inefficiently?

Mr. BROWN. We think that no Federal Government function operates quite as efficiently as the private sector functions, since we do not have to come up with a bottom line.

Senator GORTON. Is a State university a private function?

Mr. BROWN. No, it is not.

Senator GORTON. Is a State a private function?

Mr. BROWN. No, sir, it is not. I think that is correct.

Senator GORTON. Mr. Brown, the administration's budget request calls for a reduction of about 50 percent in funding for the Bureau's Institute for Computer Sciences and Technology. Specifically which of the Institute's programs are proposed for elimination and which would be retained?

Mr. BROWN. The activities that NBS would cease work on essentially are the research in open system data connection. Other work would continue, but at somewhat lower levels: software management, end user computing, security, although that would be at the same level; information management, some work on networking, input-output interface standards, advanced computer measurements, and storage media standards.

Senator GORTON. Is not this proposal almost exactly the opposite of what was proposed for ICST last year?

Mr. BROWN. We do have a change in circumstance, Mr. Chairman. We now have a private sector organization that was being encouraged by NBS which has been formed, a cooperative research organization to address OSI standards. The Corporation for Open Systems, recently formed, has a $4 million annual budget to pursue OSI and we think that that can absorb a fair amount of the functions that we thought were important for the Department of Commerce Bureau of Standards.

Senator GORTON. So it is the Corporation for Open Systems that causes you to make this change and recommendation?

Mr. BROWN. That is correct. The priority is still the same, but we would see it done by the private sector.

Senator GORTON. In your view, what are the appropriate respective roles of defense agencies, civilian government agencies, and the private sector in computer security?

Mr. BROWN. Well, the private sector role is to really implement their own plans. We see the role of NBS to help industry and civil agencies through the development of guidelines and procedures in this regard to implement the level of security relative to their particular needs, and they are not all the same, obviously.

We see the key role of the security agencies of government in being able to provide the entry code systems that can provide computer security.

Senator GORTON. National Security Decision Directive 145 established a computer security program within the National Security Agency. Does NSA's program provide adequate computers and security for civilian government agencies?

Mr. BROWN. I think it does. The program is reviewed over a long period of time. It is signed by the President only after a workable system is assured, and we think it will.

Whether it currently does is another question, but we think it can in the future, sir. It has not been made applicable by all of the nonsecurity Federal agencies.

Senator GORTON. Does the Department believe that the private sector should address computer security problems with no support from the Federal Government?

Mr. BROWN. No, not no support from the Federal Government. We do provide some support.

Senator GORTON. What would you provide if we accept your budget?

Mr. BROWN. Well, the Federal Government, back to NSA, provides the keying system by which the computer systems of private organizations is locked up, if you will. And the job of the Bureau of Standards is to provide those standards for the private sector in how its particular computer systems will function.

Senator GORTON. What specific objections does the Department have to the computer security program proposed by H.R. 2889?

Mr. BROWN. The Brooks bill, sir?

Senator GORTON. Yes, sir.

Mr. BROWN. We oppose the Brooks bill and I testified on it as being unnecessary because it would establish two parallel systems of security, civil and defense. And it also presumes a competence on the part of the National Bureau of Standards for code entry control, beyond code entry control, that we do not think exists.

We think that the control system for security literally is a code entry system and that it is very difficult to do it in any other mechanical way. It would require GSA and NBS to oversee extensive training, and that really is not a function of the National Bureau of Standards, either as a training organization or a regulatory organization.

Senator GORTON. There were, as you know, a number of proposals which the Bureau made which the Department rejected in its budget request to us. Now, I presume that they could have been rejected for one of two reasons or perhaps a combination of two reasons.

One obvious one is budget constraints; there just was not money, even though they are good programs. The second objection could have been that they are not appropriate for the Federal Government in any event, even if we had the money. Maybe it would be a combination of the two.

Let me ask you your view with respect to some of those proposals, as to which side of the equation they fall on. The Bureau apparently——-

Mr. BROWN. I think I can simplify the answer for you, Mr. Chairman, by suggesting that I am not sure that there is anything that is improper for the government to do. There may be a number of things that it would be nice to have the Federal Government into if we had the money. But I think there are some things that probably should more properly be done by the private sector. Fire and building activities we think, and have felt for some time, falls in that category.

Senator GORTON. If I can just lump three of them together, the Bureau wanted $6.3 million for microwave metrology, $7.7 million for research in high performance composites, I gather a little bit of the research you asked for and were turned down by OMB, and $5.8 million in funding for bioprocess engineering.

Would your answer be that all three of those things would have been good and relatively appropriate for the Federal Government, but regrettably there just simply was not money available for them and they were not high enough priority to be included?

Mr. BROWN. I think that is correct.

Senator GORTON. Later this morning we will hear testimony about the importance of several Bureau programs to the measurement and calibration community. You have gone on record strongly as supporting these programs, including process quality control, millimeter and microwave standards, and fiber optics.

How do you explain what these witnesses consider to be a lack of adequate funding for any of these programs in the Department's budget submission originally to OMB?

Mr. BROWN. Well, the explanation, sir, is our part of the reduction of the $200 billion deficit of the Federal Government, I guess. Let me just point out that the Bureau of Standards is one of those agencies within the Department of Commerce which did not have any budget cuts in total, and so relatively our emphasis on the Bureau of Standards has increased as the total budget of the Department of Commerce has been reduced.

But we have tried to incrementally go into that list of standards, process control, process and quality control, which you make reference to. And as soon as I can find the right page, I will turn to it, because I had some additions on my sheet that I wrote down and I wanted to give those to you.

Senator GORTON. Go ahead, finish that.

Mr. BROWN. I found the tab. Excuse me, sir.

In 1985 we added measurements for radiation therapy and protection and vacuum and leak rate to our quiver of arrows in this particular field, a total of $556,000. Those were the first two priorities at that time.

In the fiscal year 1986 budget we added three more: spectroradiometry, impedance, and microwaves performance, for another almost $2 million, a total of $2.5 million. And in the 1987 fiscal year request, we added primary standards research, high pressure AC and DC voltage, and radon measurements, for another $1,330,000.

Total for the three years of $3,830,000, and representing the first nine priorities on that list. We are working our way down the priority list that embraces at least on our schedule now 26 different specifics. It is our hope that we can get those undertaken by the Bureau as rapidly as possible.

Senator GORTON. Senator Gore.

Senator GORE. Thank you, Mr. Chairman.

I would like to welcome my former colleague Bud Brown before the committee. We served together for a long time on the House Commerce Committee, and how often I have wanted to have the chance to ask questions of him.

Mr. BROWN. We always had that opportunity when we were on the other end of the committee, Mr. Senator. And I must say that it is with a great deal of pleasure that both of our statuses have changed.

Senator GORE. Indeed. Well, it is good to see you.

Let me ask just three brief questions before I have to take off, and I appreciate the chairman's courtesy in letting me go forward here. I agree with the thrust of his questions about the Center for Building Technology, and I do not think it should be eliminated.

I wanted to ask about another aspect of it. In west Tennessee, we have the site of the largest earthquakes that have ever occurred in North America. In fact, three that occurred there in the last century were larger than all of the other earthquakes in North America put together. And the predictions are that it is only a matter of time before the activity recurs.

They are infrequent, but they are highly destructive when they do take place. And so people with common sense in this area have long recommended that we continue research on how to construct buildings that are earthquake-resistant, how to come up with codes that minimize the damage and insurance loss, et cetera.

The center of the Federal Government's activity in this regard, the main site of research on these problems, is the Center for Building Technology. Does the Administration really believe that the Federal

Government should abandon its research on earthquake engineering and building safety?

Mr. BROWN. Well, Senator, a lot of that work—and let me say that I am familiar with the fault to which you have reference, because we have a very famous Ohio Indian that became even more famous by predicting that earthquake without the advantage of the National Bureau of Standards and became therefore one of the great leaders of the Indians.

So if we can help you predict it, why, we would be more than happy to do so.

Senator GORE. Is he still around?

Mr. BROWN. No, he is not. He managed to get involved in the War of 1812 and did not make it.

But if the work were not being done elsewhere or some work were not being done elsewhere, perhaps this would be an appropriate function for the Federal Government. But work is being done in private centers. As a matter of fact, I have seen some work done as close as Cincinnati to both of our homes by private industry in this field.

We have considerable work being done, to the tune of $15 million, which is more that we are spending on all of the building programs.

Senator GORE. Who is?

Mr. BROWN. Being done by private universities.

Senator GORE. Who in the private sector is doing this research?

Mr. BROWN. There is a firm in Cincinnati that has done some research on earthquakes, because I have seen the earthquake table that they have, and it is in the Claremont County area outside Cincinnati.?

Senator GORE. Do they do research on how to construct buildings to withstand earthquakes?

Mr. BROWN. They have done some research on the impact of buildings.

Senator GORE. What is the name of that company?

Mr. BROWN. I wish I could tell you. I'll get it for you.

Senator GORE. Do you know how much money they spend on it?

Mr. BROWN. I do not.

Senator GORE. Could you provide that for us?

Mr. BROWN. I am not sure I can provide what a private company is spending, but I have seen the earthquake table model that they have and can provide you the name of the company. Perhaps you could inquire directly.

Senator GORE. Well, my presumption would be that there is—I really want to say this carefully—but my presumption would be that there is really no comparison at all between what the Center for Building Technology is doing and what this unnamed company might be.

Mr. BROWN. I can identify it for you. I will be glad to name it for you, but it does not come quickly to my mind. I mentioned the company only because you made reference to the area.

But $15 million, which is more than we are spending on all of the building research, both Federally funded and done under contract, is being done by about 50 universities.

Senator GORE. With Federal funds?

Mr. BROWN. No, privately, non-Federally, non-Federally?

Senator GORE. Which universities are those?

Mr. BROWN. Well, among the universities that are involved in building work are Purdue University, Stanford, Ohio State, the University of Illinois—all reasonably qualified institutions.

How much work is devoted just to earthquakes, as opposed to building technology itself, I am not sure I can identify for you.

Senator GORE. Oh, this is the amount of money spent on research into all building technologies at universities?

Mr. BROWN. No. 50 universities are conducting research in building technology. The total value of that is about $25.4 million. Earthquake technology, according to my notes, is about $15 million. Earthquake and engineering conservation concerns cover about $15 million.

Universities that are involved in all of these fields include Purdue, Stanford, Ohio State, and the University of Illinois.

Senator GORE. Engineering conservation? Is that energy conservation?

Mr. BROWN. Did I say energy? I thought I said engineering conservation.

Senator GORE. So the $15 million represents both? Do you have a breakdown?

Mr. BROWN. No, I do not.

Senator GORE. Okay. And there is a lot of work being done on energy conservation. Anyway, if you could give us a further breakdown again, my presumption would be that that would illustrate the fact that there is really no comparison between what is being done in the private sector and what the Center for Building Technology does.

Mr. BROWN. Well, our expenditures—I should make clear what the expenditures of the Building Technologies Center are in earthquake activities, and it is a half a million dollars. It is a relatively small amount by comparison.

Senator GORE. Specifically focused on this one item—and I would be interested if you could find anything in the private sector which corresponds to what the Center for Building Technology is doing.

Mr. BROWN. Well, let me restate, so that we both understand, what we have in the way of figures.

Senator GORE. I understand. But it is a large catch-all category. You have got energy conservation in the same category.

Mr. BROWN. Energy and earthquakes is about $15 million; energy conservation and earthquake technologies, about $15 million in non-Federal institutions. In the entire building technology area, we can identify about $25.4 million. Our budget for building technology is about $11.9 million, of which $3.9 million is appropriation and $8 million is reimburseable.

So the point I am suggesting is that that $11.9 million in total in building does not add up to what is being done in earthquake and energy research by other institutions.

Senator GORE. But again, it may very well be apples and oranges, or fruit and vegetables, because there may be zero being spent in the private sector on the specific problems that I am asking about here.

Mr. BROWN. You mean on the Tennessee fault?

Senator GORE. No, no. On the ability of engineers to construct buildings that are more resistant to large quakes of the kind which occur along the New Madrid fault and elsewhere in the country. But we will have to get more detailed figures from you to find out whether that is the case or not.

Mr. BROWN. We will try to get those figures for you if we can acquire them, Senator.

Senator GORE. Okay. Thank you.

Now, this next question probably should be addressed to Dr. Ambler and perhaps it will be followed up on. I will not be able to stay. But I am very intrigued by the new request for funds on research into fiber optics. I support that effort, I think, but I would like to know what kinds of activities the Bureau intends to undertake in this area.

Mr. BROWN. You are correct, Senator, the details of these programs is not a function of my technical knowledge.

Senator GORE. Okay. Well, hold off on that and I will ask Dr. Ambler to include a response for the record on that if I cannot stay.

Third, the Center for Fire Research. Having just had an experience with a fire, I am even more aware of how important it is to continue this work on such things as smoke detectors and fire resistant materials, the latter comprising the focus of most work right now.

And I just do not understand why the Administration persists in trying to eliminate this Fire Center when it knows full well that there is almost no chance whatsoever that a private or State group will do this research if the center is abolished, and in light of the enormous cost to the economy and the loss in lives and the mitigating work which has been done and could be continued by the Center for Fire Research.

Why does the administration persist in trying to do away with it? Mr. Brown: Senator, once again it is a total question of priorities. The question was asked earlier what we thought was inappropriate. I suggested that there were very few things that we would concede that the Department of Commerce is doing which are undesirable, but there may be some that are inappropriate given the budget considerations of the Federal Government at this point and the large base of industry activities that go on in some of these areas.

You mentioned products, and I guess I would repeat the example I gave you. The household furniture industry in the United States is a $16.4 billion industry. I would think that if a company were producing a flammable item that it might want to do some research to protect itself, given the change in tort law or insurance costs that are going on in the United States today.

And perhaps the plastic industry, which is an $18.7 billion industry, and perhaps the insurance industry itself might wish to take up some of this research. We are talking about in those two industries combined $35 billion in receipts, about 5.8 million bucks, which is a very, very small percentage of the cost to those industries.

We would like to encourage those industries to undertake some of this work themselves.

Senator GORE. Mr. Chairman, this witness has not changed a bit.

Senator GORE. I appreciate the chance to ask some questions, Mr. Chairman. I apologize to the other witnesses for having to leave.

Senator GORTON. I will be glad to submit all your questions.

Senator GORE. Thank you very much.

Good to see you.

Senator GORTON. Mr. Brown, I had a substantial number of additional questions for the Department myself, but we do want to hear from other distinguished witnesses. And while we have not known one another as long as you and Senator Gore have, I would say that I am delighted to see you again as well.

Mr. BROWN. Thank you, Mr. Senator. My pleasure to be with you.

[The following information was subsequently received for the record:]

Questions of Senator Gore and the Answers

CENTER FOR BUILDING TECHNOLOGY AND CENTER FOR FIRE RESEARCH

Question 1. At the hearing we discussed the building research done at NBS as compared with building research in the private sector and universities. We particularly discussed earthquake engineering work. I have three specific questions about the role of companies and universities.

First, would you please identify the firm in Cincinnati that has done research on earthquake engineering. What kinds of work has it done? Are the results proprietary or, like the Bureau's, publicly available? Does their testing facility have the same abilities as the Bureau's two loading facilities, including the ability to test large structural members such as bridge pillars at full scale?

Answer. The firm in Cincinnati, Ohio which performs earthquake research is Structural Dynamics Research Corporation. SDRC tests equipment that will be used in nuclear power plants for resistance to seismic events on a 3-axis, 10′-x-10′ table. The table was specifically designed for this purpose and has not been used to test building materials. SDRC's research is proprietary in nature. Further information about the table can be obtained by calling Jack Martz, VP of Engineering Services at SDRC, at (513) 576-2501.

Question 2. Second, you mentioned that American universities perform $25.4 million worth of building research, with about $15 million of that spent on earthquake work and energy conservation. Would you please provide details on which schools perform which work, as well as the source of their funding. Exactly how much is spent on earthquake engineering?

Answer.

[Dollar amounts in millions]

Source of funds	Earthquake research	Energy conservation	Other building research	Examples of universities performing the work
National Science Foundation	$10.0		$1.0	University of California (Berkeley); Stanford University; California Institute of Technology; University of Washington; Massachusetts Institute of Technology; University of Illinois; University of Texas.
Department of Energy		$5.0	1.4	University of California (Berkeley); University of Arizona; University of Florida; Purdue University; University of Wisconsin; Colorado State University.
Construction Engineering Research Laboratory (CERL).			8.0	University of Illinois; University of Michigan; Purdue University; Massachusetts Institute of Technology; Carnegie-Mellon University.

Question 3. Third, the Center for Building Technology performs three structural research services that I believe are unique in this country: (a) direct support to voluntary standards organizations to help them develop new standards and model building codes; (b) interdisciplinary work on practical problems of structural safety; and (c) objective, non-proprietary investigations of major structural failures. I know of no private or university group that provides those three services. University researchers work on problems that are of interest to them, not necessarily on pressing safety problems. Most industry work is proprietary. Do you know of any private or university groups that provide these three services?

Answer. I do not know of any private or university group that provides direct technical support to voluntary standards organizations, conducts interdisciplinary work on practical problems of structural safety, or performs objective, non-proprietary invstigations of major structural failures with results made public.

Nevertheless, I believe that the private sector and State and local governments should and will fund continuation of this work to the extent they need the research. The private sector has economic incentives to assure improved building and structural safety. Building safety regulations and codes are traditionally overseen by State and local governments.

Question 4. Among other things, the Center for Building Technology provides advice and research for the National Earthquake Hazard Reduction Program led by the Federal Emergency Management Agency. FEMA relies on NBS to evaluate contract proposals and to help develop model building codes.

Exactly how much would it cost the Federal Government to replace CBT's services to FEMA with those of a private contractor? Would "privatizing" this function end up costing the taxpayers more than the current arrangement?

Answer. I am not in a position to determine exactly how much FEMA would have to pay a private contractor to replace CBT's services. If this function could be "privatized", I estimate that the initial costs may be higher but long-range operating costs should be approximately the same, provided that the Bureaus' facilities are utilized rather than duplicated elsewhere.

Question 5. Besides its work on structures, CBT's interdisciplinary team also performs research on other aspects of buildings, including energy conservation, thermal properties, lighting, and indoor air pollution from such substances as radon. Here, too, the Center works closely with voluntary standards organizations.

Which private and university groups, if any, perform this kind of research? Do any of them work closely with standards organizations? Do you have any firm evidence to suggest that they would pick CBT's important work if CBT were abolished?

Answer. I know of no other private and university groups that perform the type of interdisciplinary buidling research conducted by CBT. Voluntary standards organizations rely on the Bureau's technical expertise and objectivity for advice on establishing standards. I have no evidence that other private or university groups would pick up CBT's work if the Center were abolished. As long as there is an indication that the Federal government will continue this type of work, it is not surprising that the private sector has not increased its spending for this research. Nevertheless, I believe that the private sector and State and local governments should fund the continuation of CBT's work, to the extent that they need the research. The private sector has economic incentives to assure improved building safety; building regulations and safety are traditionally overseen by State and local governments.

Question 6. At the hearing, you said that you believe that the furniture and plastics industries should fund more research on fire. However, you presented no evidence that they in fact can or will do so.

Does the Department have any evidence whatsoever to indicate that either industry or the States would pick up the research now performed by the Center for Fire Research? In particular, do you have any firm financial commitments from industry? Is there any industry consortium analogous to the new Corporation for Open Systems?

If the Department has no such evidence or commitments, then does the Administration in fact want to abandon all national research to reduce fire deaths?

Answer. The Department has no specific evidence that either private industry or the States will pick up the research now performed by the Center for Fire Research if Federal funding for the Center is eliminated. The Center in fiscal year 1986 has private sector funding of $285K from three private companies and five industry groups. In addition, it is expected that the CFR will receive about $200K late in fiscal year 1986 from the National Fire Protection Association Research Foundation which is funded predominately by private industry.

There is no industry consortium for fire that is analogous to the new Corporation for Open Systems.

As long as it appears the Federal government will continue to fund these programs, it is not surprising that the private sector is not increasing its contributions.

Nevertheless, I believe that the private sector and State and local governments, should and will fund the continuation of CFR's work to the extent they need the research. The private sector has economic incentives to assure improved fire safety in products and building; and fire protection and safety are traditionally overseen by State and local governments.

INSTITUTE FOR COMPUTER SCIENCES AND TECHNOLOGY

Question 1. I am confused about the planned effect of the new Corporation for Open Systems (COS) on the budget of the Bureau's Institute for Computer Science and Technology (ICST). Your prepared statement suggests that the ICST budget can be cut because the new Corporation will replace ICST functions.

However, the Committee has also received testimony from one of the members of the COS, Mr. Norman Collins from Boeing. He takes a very different view: "COS and each of its member companies are depending heavily on work of NBS/ICST to achieve their mutual objective. COS does not compete with the NBS. The Corporation, like its members, is not a standards setting body. It does not supplant the work of NBS and ICST. It supplements it."

Which view is correct? Will the Bureau be able to cancel almost all of the work it now does on open systems interconnection? Or does the success of COS depend on ICST maintaining its current level of effort?

Answer. The DoC and COS have different points of view. We think it is reasonable to expect that COS, representing essentially all of the computer industry and having a budget of $4M/yr. can and should replace our $2.5M/yr. effort.

Question 2. It is my understanding that the current open systems work at ICST costs about $2.5 million a year. Yet the President's budget proposes an ICST cut of $4.7 million.

What other activities at ICST will be eliminated if Congress accepts the President's budget?

Answer. NBS would cease active research in open systems data connection. All othr work would continue, but at lower funding levels.

Question 3. In the FY 1986 budget request, the President proposed to eliminate ICST's research on computer security and information management. However, in the FY 1987 request the Administration has reversed itself and now seeks to continue funding for these programs.

Why has the Administration reversed its position on these computer programs? Does the Administration now believe that these are important activities and should be continued?

Answer. At the time the FY 1986 budget was prepared, the Administration felt it was important for ICST to concentrate its efforts on the international networking of computers to protect American trade interests. Since that time, the Corporation for Open Systems has been formed to accelerate the development and testing of products based on OSI standards. These efforts will enable U.S. industry to develop a unified and strong presence int he computer marketplace nationally and internationally. Therefore, priorities can be reordered and ICST can now concentrate on all ADP needs of the Federal government, including federal networking.

OTHER PROPOSED NBS BUDGET CUTS

Question 1. The budget request proposes a $1.5 million cut in NBS' "Competence Fund"—the program that funds new small pilot work in important areas of emerging technology. As I understand it, this cut would allow NBS to continue on-going projects but would prevent the Bureau from starting any new ones during FY 1987.

Since Competence Fund projects are the main way in which the Bureau builds expertise in new areas, won't this decision in fact prevent NBS from gaining the knowledge it needs to help American industry compete in new technologies?

Answer. As a result of the $1.5M reduction NBS will not start any new competence projects in fiscal year 1987, however, the $7,500,000 remaining in the Competence Fund will allow NBS to resume rollover of completed projects in fiscal year 1988. This will allow new projects totaling $1.0 million to $1.5 million to be started in that same time frame. Continued projects for fiscal year 1987 include condensed phase chemistry, surface chemistry, separations for biomolecules, optical sensors for bioreactors, optoelectronic structures, and metal matrix composites.

Question 2. The Administration also proposes to reduce the NBS postdoctoral fellows program by $1.6 million. This program to bring young PhDs into the Bureau is one of the principal ways in which NBS can recruit new scientists and engineers.

Given that NBS already has trouble recruiting talented young people, due to low government salaries and intense competition from industry, won't this reduction in the number of postdoctoral fellowships seriously weaken the Bureau's ability to replace retiring personnel? If so, what alternative methods will you use to bring new people into the Bureau?

Answer. NBS interacts with over 100 universities in its research and standards programs. NBS will continue to hire additional PhD graduates based on these interactions and plans to recruit approximately 9 postdoc type physicists, chemists and engineers in selected program areas such as ceramics, fiber-optics and cold neutron research as represented by the requests for budget increases in these areas. Additionally, the reduced postdoc program will permit the eventual award of about 6–8 new two-year fellowships per year.

OTHER NBS ISSUES

Question 1. The budget requests $10 million for the construction of a "cold neutron facility"—a powerful machine to use a flow of neutrons to produce "pictures" of the microscopic properties of advanced materials.

What benefits do you see coming from this new facility?

Answer. The Cold Neutron Research Facility would provide critical measurement capabilities on the properties, performance, and processing of advanced materials and make the U.S. directly competitive with Europe in this critical research area and put us ahead of the current Japanese effort.

Applications for intense cold neutron beams exist in virtually every branch of materials research. For example, such a source is necessary to:

Measure the growth of cavities or cracks or to study the nature of voids in new advanced ceramics. The use of high-temperature ceramics in automobile engines, for example, can mean a 30 percent increase in efficiency.

Measure the size and shape of "engineered" biomolecules in their natural environments as changes occur. Such a capability is of major importance to the emerging biotechnology industry.

Study the distribution of "doping" elements in semiconductor materials in concentrations below one part in a million. This is a critical factor in improved process control for the semiconductor industry.

Investigate critical structures in new polymer blend materials. The improved performance of these high-technology, value-added materials makes them competitive alternatives for light-weight structural components.

Study the microscopic behavior critical to the development of improved catalysts and less expensive feedstocks for chemical production. A cold neutron source will make it possible to observe the location and movement of chemicals as reactions are taking place.

Question 2. Also, I understand that there is widespread support in the scientific and business communities for this facility. But why is the Department proposing to fund this kind of large capital project by eliminating valuable operating programs such as the fire and building centers rather than by requesting a special one-time capital expenditure?

Answer. Unlike the Department of Defense, Department of Energy, and the National Science Foundation, the National Bureau of Standards has no appropriation for one-time special facilities expenditures. In a situation of fiscal restraint the Department of Commerce did not believe it was appropriate to request a new appropriation for capital expenditures. The funding for the Fire and Building Centers is recommended for elimination because the work has reached a stage where it can be taken over by private sector and State and local governments.

Question 3. NBS recently prepared a long-range plan for internal policy discussions. We would be interested in seeing this document, since it reflects the Bureau's technical judgments about the future technological needs of American industry. We understand, of course, that this is not an official Commerce Department document and does not necessarily reflect future departmental budget priorities.

Will you please supply this long-range plan to the Subcommittee, with the caveat that it does not necessarily reflect official Departmental policy?

Answer. The plan has not been cleared within the Department. I will be pleased to discuss the plan with you when it has been.

Senator GORTON. Dr. Ambler

STATEMENT OF HON. ERNEST AMBLER, DIRECTOR, NATIONAL BUREAU OF STANDARDS; ACCOMPANIED BY RAYMOND G. KAMMER, DEPUTY DIRECTOR

Senator GORTON. You are certainly welcome back here again. We are happy to see you and your colleague, and we would be delighted to hear from you.

Dr. AMBLER. Thank you, Mr. Chairman. I am delighted to be here again also.

Before I speak about the appropriation request for fiscal year '87, I would like to very briefly review the situation for fiscal year '86, the present fiscal year. We received an appropriation of $123,985,000 and, as was the case with most other civilian agency programs, reductions of 4.3 percent were allotted to NBS for fiscal year 1986 following the

Balanced Budget and Emergency Deficit Control Act. That meant a reduction of $5.3 million in the funds available to us.

The reductions have been pro-rated to each of our budget line items and will be achieved without termination of existing research or reduction in force. This strategy is I believe consistent with the intent of the legislation. Our interactions with industry, universities, and other Federal agencies continue to grow. For example, there has been an increase in industrial research associates at NBS from 95 in fiscal year 1980 to over 200 in fiscal year 1985. And the trend is still upward.

Our guest workers have increased from 370 to 503 in the same time frame. During this five-year period, the number of calibrations performed has risen and our sale of standard reference materials has increased from $3 million to $5.2 million annually.

Our total cost-sharing with industry, which in an area where there is the biggest increase and the greatest activity, has more than tripled from $18 million in 1980 to $60 million in 1985.

Mr. Brown has highlighted the 1987 budget request. I would just like to make a few comments. This year we will introduce the cold neutron source into the NBS reactor core. We will be able to extend our management capabilities on our two existing experimental stations by factors of ten or more.

These two stations are designed to study the structural features of advanced materials, as you indicated in your opening statement. While the two instruments will provide an important capability, our nation will still be left far behind our international competitors, without access to more adequate cold neutron measurement technology.

Our request for fiscal year 1987 will allow us to develop a truly national facility, with 15 experimental stations. This proposed national facility has received the highest priority from the National Academy of Sciences panel and from the administration and reflects a very strong priority for the whole materials research community in the United States.

Our budget request for advanced ceramics will expand our work begun in fiscal year '86, and you alluded to that. You also alluded to the work on fiber optics. And Mr. Brown emphasized the importance of the consolidated scientific computer system and the fact that we need now to bring effort to bear on the efficient use of the first-rate supercomputer that we have.

Reference has been made to the elimination of the Center for Building Technology and the Center for Fire Research and the reductions in the Institute for Computer Science and Technology. Other decreases are in the technical competence program of $1.5 million and the postdoctoral research program, at $1.6 million.

I think your opening statement is one that we all subscribe to, and the National Bureau of Standards, having as it does the mission of aiding U.S. industry in science, has today more than ever before, I think, an extremely important one.

But we cannot be all things to all people, operating in the kind of fiscal environment that you describe. We simply cannot do everything. Those of us who formulated the budget for fiscal year 1987 recognize that, and our initiatives focus on the areas where we are likely to have the biggest impact in helping U.S. industry to compete and to do better in international trade.

Our knowledge and technology are this country's major asset and advantage in assuring national economic strength and in competing with other nations. That means we have to make the most of our research resources, our equipment as well as our people.

Cooperation in research and development is one obvious answer. This is something that we at NBS have been doing from the start. We have made cooperation with industry a way of doing business, and I believe we have served as a model for the cooperative arrangements which are becoming more popular today, as industry, universities, and governments form research partnerships all over the country.

As I indicated, we are using cost-sharing more and more, and I think much more effectively.

I think this should continue. I think more and more now that cooperation in R&D is great and should continue, but it is not enough. Doing research is only half the battle. The results of this research must be incorporated into new ideas, new processes and new products.

New technology must diffuse throughout our industry and diffuse more rapidly than it does now. We need to think about cooperation in the transfer and diffusion of technology in the same way that we have addressed cooperation in R&D.

We are trying to take the lead here, too. We spend a good deal of time with visting scientists, engineers and managers from industrial firms. We have taken other steps to encourage technology transfer by holding hundreds of conferences and workshops and seminars each year and in many other ways.

We have had to make hard decisions on priorities at NBS. The budget before you includes increases to expand certain programs and reductions in others and represents a careful review of those priorities.

Facilities like our proposed cold neutron research facility are, in my view, crucial to supporting the materials community in the United States.

I know this committee recognizes the critical importance of this proposal. I know that there are conflicting views on where the Federal Government should and should not be spending its scarce resources, but I also know we must find a way for the system to work so that we can move forward in many areas of technology that we are required to move into, particularly into cold neutron research.

Thank you, Mr. Chairman. I appreciate the opportunity to summarize my statement.

Senator Gorton. We are happy to listen to that statement. As I did with Secretary Brown, I would like to start you with questions on the fire and building centers.

Would you describe the types of services performed for other Federal agencies, by fire and building services?

Dr. AMBLER. Yes. While Mr. Kammer is looking up the details. Let me say that the amount of work we do on contract for other Federal agencies is, in the Center for Building Technology somewhat more than half of the total effort, and in the case of fire, somewhat less. On aggregate, it is about 50-50.

These departments that I will name apply to both the building program and the fire research program: the Consumer Product Safety Commission; the Department of Justice; FEMA; Department of Energy; General Services Administration; and Nuclear Regulatory Agency.

Senator GORTON. Are these carried on as a matter of accommodation, or are there legal requirements to provide these services?

Dr. AMBLER. There are no legal requirements on our part. Our Act says that we should exercise our functions in support of the Federal agencies. There are no legal obligations to do so as I recall.

Senator GORTON. My staff indicates there are some for FEMA.

Dr. AMBLER. There are responsibilities related to the fire program inasmuch as the fire program, of course, is part of our Organic Act, and we are mentioned in the Earthquake Hazards Reduction Act. In both of those cases the language is not mandatory. It is the same kind of language that is typical of the language of our Organic Act.

Senator GORTON. If the centers are eliminated, will those services simply be discontinued or will these other Federal agencies have to contract outside of government?

Dr. AMBLER. You mean would we continue to do——

Senator GORTON. I do not mean you. Obviously if we do not have the centers you will not be performing the services.

Does this mean they just will not get performed at all or they will have to be contracted out?

Dr. AMBLER. They would have to be contracted out. I am pretty sure there are a number of universities that could pick up probably all of the work.

Senator GORTON. Do you imagine that it will cost these other Federal agencies less or more buying the services that way?

Dr. AMBLER. I would imagine it would cost them about the same, but I do not know.

Senator GORTON. Will you support the use of the fire and building services, a continuation of the fire and building services on a complete cost-reimbursable basis if we should decide to continue them but not to have any direct appropriations for them? Could they be run that way, and would you recommend that they be run that way?

Dr. AMBLER. If I may ask for a little clarification of the meaning of your question. If the funding became available, let us say, from the private sector or state and local governments as well as the existing reimbursements for other Federal agencies?

Senator GORTON. We make no appropriation for either of those centers, but we direct that they be continued on the basis of operating at least at a break even level.

Could you keep them going under those circumstances, and would you want to?

Dr. AMBLER. Could we keep them going at the reduced level? I suppose it is possible. Would I want to? As a general rule I think it is not a good idea for an organization such as the National Bureau of Standards to conduct a program with no direct funding from Congress.

By doing so you can often get into a job shop situation and could not use your own ideas and discretion to build competence and make sure that what you are doing is underpinned by some solid research. To do that, I think, would be a very risky thing. I would worry about, after a number of years, the Bureau ending up doing a job that we were not particularly proud of.

Senator GORTON. If we close them down, what will happen to the facilities of these two centers?

Dr. AMBLER. The special facilities, and there are a number of them both in fire and building, would be available for use by those who would come forward and agree to fund the work on a suitable reimbursable basis.

Senator GORTON. Why did the Bureau initially request no funding for the centers and then appeal the Department's decision not to fund them?

Dr. AMBLER. Now you are talking about in the development of the Fiscal Year 1987 budget, Senator?

Senator GORTON. Yes.

Dr. AMBLER. This looks a little strange, but it was a technicality because when we formulated the budget Congress had not acted on our appropriations, and we had to make certain assumptions. So as things moved along and Congress did act, then the situation——

Senator GORTON. Was the assumption that you made that they were not going to be funded in 1986?

Dr. AMBLER. The first assumption we made, of course, was the President's submission for 1986.

Senator GORTON. I see. The Committee has followed the progress of the open systems interconnection project and the formation of the corporation for open systems.

In what ways are the private sector efforts dependent on support of the Bureau's Institute for Computer Sciences and Technology, and in what ways has the project obviated the need for the institute's programs?

Dr. AMBLER. In the particular area of open systems interconnection, this program has, I think, an extremely interesting history and it goes back quite a long way.

As early—if I could use that term—as 5 years ago the interest in the private sector in really putting a big effort on this, connecting different computer systems together, was not very high. We struggled mightily in some of the private sectors' standards groups to get things going.

Within about 3 or 4 years the situation changed dramatically, and it changed dramatically principally because of economics. I think our people were very skillful in anticipating what was happening.

The users began to realize that as they began to connect different divisions of their corporation, or they wanted to communicate and connect different computer systems together to do so, it really cost them an arm and a leg. There was tremendous interest, then, in the banking community, insurance community and the big corporations that this was a problem that they had better get interested in.

We had little difficulty, then, in getting them interested in the voluntary standard system. When that happened the main frame manufacturers took attention of that because the customers were making demands.

Over the last 3 years there has been great interest, and I think the Corporation for Open Systems is a very concrete manifestation of that where all the main frame manufacturers, I believe, have become members. The international implications are very clear, so that the whole situation has changed dramatically.

Furthermore, the kinds of things that you have to do in writing these protocols for the open systems really bear upon products and product design. It really is very much a product standards business now, and I think we have played an enormous role, a catalytic role, in getting it all going and showed leadership. I do think that the sheer economics of the situation are driving it now.

Senator GORTON. Let me ask you the same kind of question with respect to ICST as I did with the two centers. What kind of work does it do for other agencies, and how will that work be affected by the President's budget proposal?

Dr. AMBLER. In fiscal year 1985 for which we have the figures, the reimbursable funding was $2.6 million for ICST. There is a lot of work done for the three armed services, Department of Justice, NASA, Nuclear Regulatory Agency and several others.

Senator GORTON. What happens to that work with the President's budget? Is it affected adversely?

Dr. AMBLER. It is not affected. In fact, the total amount of reimbursable work for ICST is increasing.

Senator GORTON. So even if we accept the President's budget, that kind of work will go on?

Dr. AMBLER. Yes.

Senator GORTON. The Bureau has expressed interest in conducting research in high performance composites. Would you describe your vision of the Bureau's involvement in this field and the potential benefits to private industry?

Dr. AMBLER. The Bureau's role in this field will be the same kind of role that we usually play; namely, understanding the fundamental structures of these particular materials.

The most important aspect which we would concentrate on would be this question of the interface; namely in a composite material, of course, you have the use of properties of different materials, but you have to put them together and they have to stick together.

Often the places that are vulnerable, where failure might occur, is out at the interfaces. So understanding the structure of interfaces at the atomic level would be one of the things that we would do in that area.

Senator GORTON. What did Gramm-Rudman's 4.3 percent cut to this year's budget mean with respect to the programs of the Bureau?

Dr. AMBLER. Yes, I described how we are handling it in general terms, but——

Senator GORTON. The way in which you carry out your functions, how badly did it hurt you?

Dr. AMBLER. We have cut back on some of the other objects expenses, travel and so on, but I think the principal thing that we are doing is to slow down hiring which is a thing we cannot do forever. We felt that since we had to cope with it rather quickly and since we will all be interested to see how that bill works out in 1987—we felt we were better off handling it in that way and keeping our flexibility open to see how things develop.

Senator GORTON. So you really have not cut out any functions?

Dr. AMBLER. No, no, we deliberately did not. In fact, we interpreted the legislation to be that it is across the board, and we tried to do it exactly in that way.

Senator GORTON. Now, I understand that the House authorizing subcommittee is considering a five percent across-the-board program cut for Fiscal Year 1987.

Adding that on top of this one, what kind of impact would that have?

Dr. AMBLER. I think as a general rule this sort of thing is acceptable as a temporary expedient until you are sure of what you are going to be faced with, but cutting a little piece off of every program as a matter of year-to-year living is not a very good idea.

Senator GORTON. Let me interrupt you, then. If you were to suffer another 5 percent cut in 1987, and I emphasize the "if", I gather you would rather prioritize it, preserving completely some programs and cutting way back on others rather than just to try another total across-the-board?

Dr. AMBLER. Yes, another $5 million on top, yes, I would, if that were on top.

Senator GORTON. I would assume that to be the answer, but I wanted to find that out from you.

Dr. Ambler, I am delighted as always in having you here. I have additional questions for you. As you heard earlier, Senator Gore and perhaps some other senators do as well.

I am going to let you go now because we do have so many other witnesses, but I do want to tell you that your agency is one that this subcommittee looks on with great favor and feels that it does an extremely effective job for the Federal Government and for our states and for the private sector, and we want to do the best job we possibly can for you to allow you to do the best possible job you can under the constraints which we are operating today.

Thank you very much.

Dr. AMBLER. Thank you, sir.

[The following information was subsequently received for the record:]

QUESTIONS OF SENATOR GORE AND THE ANSWERS

Question 1. As I mentioned at the hearing, I am very interested in your proposed research program in fiber optics. I have two questions about it.

First, what kinds of activities will the Bureau undertake in this area, and how will the Bureau's activities help this important new industry?

Second, the history of your budget request indicates that you originally requested an FY 1987 fiber optics budget of $10,000,000. The Department granted you a total of $1.7 million—$950,000 in new money combined with your existing level of $750,000. If the Bureau were to receive the full $10,000,000, what additional activities would you undertake, and how would they help American industry?

Answer. Optical communication systems involve not only the optical fibers themselves but light sources and detectors, planar waveguides, optical switches, modulators, multiplexers, and demultiplexers. All of these components are new and often technically quite complex in themselves. A wide spectrum of new measurements needs to be developed for these components, the systems that are assembled from the components, and the materials from which the components are made. The measurements may be used to specify materials, components, or systems for sale, to obtain engineering data for use in product design, or to control the manufacturing process. All of these uses are important to industry.

At the $1.7M level, the most urgent of the near-term measurement problems will be addressed. These are for planar waveguides, light sources, and detectors, which are in increasing use today and which are subject to very strong international competition, particularly from Japan. At the $10M level work would also be done on the highest priority additional topics, such as optical switches, modulators, multiplexers and demultiplexers, and would provide an early start on longer-range problems for systems and components of the next generation.

The $1.7M level for NBS measurement research will make a valuable contribution to U.S. industry. With the rapid growth of optical communication world-wide and the equally rapid pace of technological development, a strong NBS program will be of value to U.S. industry. We are told that the patterns of competition for the future will be established within the next few years, and that NBS work in this field will have its greatest positive effect if it can be started soon.

Question 2. In your written testimony, you say that this years 4.3 percent budget cut meant a reduction of $5.3 million in the funds available to the Bureau.

Can you give us some additional details on how you have absorbed this cut and which specific research programs and activities will be affected?

Answer. Reductions have been spread across all NBS programs and no projects will be terminated. Savings will be achieved by (1) severely restricting the hiring of new staff when separations occur ($1.5 million); (2) restrictive ceilings on travel ($200 thousand); and (3) reductions in other objects spending, particularly procurements for contracts, grants, supplies and materials, and equipment ($3.6 million).

Question 3. Your budget increases this year are primarily in the area of high technology—advanced ceramics, fiber optics, the cold neutron facility for materials research.

In general terms, what are the technical problems and barriers facing new high-tech areas of American industry? For example, are there often problems of quality control in developing and manufacturing these new products? What do you see as the Bureau's role in helping American industry stay competitive in these high-tech areas?

Answer. The technological infrastructure for the technologies of the 21st Century is now being created. New technologies are moving from the laboratory to production and to market at an accelerating rate. The country whose industries get from laboratory to market fastest is the country that is going to dominate the economic race in the next century.

NBS plays a vital role in that race. Today as yesterday, the Bureau's tools are science and technology. The Bureau's products are measurement methods, evaluated scientific and engineering data, test methods, standard reference materials, and technical information. The Bureau's clients are the public, government, industry, and universities, but especially American industry.

For industrial research and development, NBS adds to the pool of basic knowledge that all scientists and engineers use. Scientific advances are often driven by state-of-the-art measurements. New measurements open up new fields for scientific investigation. Measurement technologies also make scientists and engineers more productive by making it easier to transform principles into process design and new product technologies.

In production, measurements and measurement methods are crucial to quality assurance and the control of industrial processes.

In the marketplace, NBS services ensure uniformity and equity, help buyers define their needs, help sellers verify product characteristics and performance, and generally reduce risk. Lower risk, in turn, helps new technologies "diffuse" or spread through the economy.

For many technologies, NBS technical tools are used in all stages of the industrial process: in the lab, on the factory floor, in the office, and in the marketplace. The Bureau's measurement technologies are a vital link in the U.S. economy.

Question 4. The Congress may once again decide to restore funding for the fire and building centers.

If the two centers receive FY 1987 funding at the current levels, what research would they perform during 1987? Would the fire center continue its important work on fire-resistant carpets and upholstery? Would the building center continue its work on the earthquake resistancy of bridge pillars and steel and its work on indoor air pollution and ventilation, including the ventilation of radon gas?

Answer. The following describes the areas of research that CFR would perform in fiscal year 1987, assuming restoration of funds at or near FY 1986 levels:

Fire Simulation—integrate models and necessary data into fire simulation and prediction techniques, and demonstrate their application to answering fire safety questions.

Compartment Fire Modeling—develop benchmark fire growth computer code for describing fire development in one or more rooms.

Fire Growth & Extinction—develop predictive methods to describe the comprehensive dynamics and elemental processes of fire growth and extinction.

Hazard Analysis—develop research models and associated computer codes to predict fire hazard development and people movement in buildings and to analyze fire risk.

Exploratory Fire Research—develop scientific knowledge of fundamental fire phenomena down to the molecular level.

Flammability & Toxicity Measurement—develop measurement methods and the underlying principles for characterizing combustibility and the impact of combustion products on living organisms.

Fire Performance & Validation—develop the methodology to assess the accuracy of fire models and design experiments to evaluate, on a realistic scale, the fire performance of assemblages.

In fiscal year 1987, the Center for Fire Research would continue to develop measurement techniques for the fire properties of interior furnishings such as carpet and upholstered furniture. A method for measuring the rate of heat release has been developed, and is under consideration by ASTM as a national standard. CFR would continue to provide the necessary technical support to ASTM. A new technique for measuring the toxicity of combustion products using pure gas measurements that is accurate enough to provide data for the hazard models is under development with initial results planned for fiscal year 1987. In addition to the measurement methods, work would continue to develop means to quantify the fire hazard from furnishings in residences and other buildings.

The following describes the area of research that CBT would perform in fiscal year 1987 assuming restoration of funds at or near FY 1986 levels:

Structural Engineering (incl. Earthquake Engineering)—develop the measurement basis for structural safety standards in the United States. Utilize computer based techniques for predicting structural safety and provide the technological basis for improved seismic design criteria for buildings.

Building Materials Engineering—develop fundamental data on building materials properties, and laboratory and field test methods for predicting service lives of building and construction materials such as concrete, roofing systems, and protective coatings for steel, and for use in quality assurance.

Building Physics—develop nationally acceptable database measurement techniques, test methods, and models for the design, construction, and operation of building envelopes and mechanical, lighting, and acoustical systems that will result in a significant reduction in the cost of operating buildings and a significant increase in the international competitiveness of the U.S. building industry.

Building Equipment—develop data, test methods, and models that can be adopted in consensus standards for the design and operation of building mechanical and electrical systems. Also, develop software performance criteria, interface standards, and test methods needed for the Nation's building industry to make effective use of modern computer-aided design hardware and software, and database management systems.

CBT would continue its work on the earthquake resistance of bridge pillars and steel structures. The experimental research on the performance of large-scale columns subjected to reversed cyclic loadings would be completed. This work would lead to improved design criteria for earthquake loadings. CBT would also continue its efforts to predict and control radon and other indoor pollutants such as formaldehyde. A model to predict the level of indoor contaminants in buildings as a function of environmental factors would be completed. This model would provide evaluation techniques that could be used to mitigate such pollutants.

Question 5. The budget proposes to reduce your "Competence Fund" by $1.5 million. As I understand it, the remaining $7.5 million would allow you to complete existing pilot projects financed by the Fund, but would allow you to start few, if any, new projects during FY 1987.

Can you explain what the Competence Fund projects are? Are they in fact "pilot projects" in new technical areas? Can you give examples of how these projects have helped the Bureau gain expertise in new areas of importance to American industry? If you can no longer start new projects, how will the Bureau be able to gain competence in new technical areas?

Answer. In 1979, the Congress and OMB agreed to establish a fund "for maintaining competences and performing basic research in furtherance of the NBS mission objectives." The projects could be thought of as "pilot projects" in which long-term, measurement-related research is conducted to develop basic knowledge, staff and techniques that will allow us to conduct programs in the future.

Some of the long-term fundamental efforts which have already had tangible effects include:

Small angle neutron scattering techniques are being applied to study the relationships among the synthesis, microstructure, properties, and performance of advanced high-performance ceramic materials—one of the most important new materials of the coming decades.

The results of work investigating the effects of ionizing radiation on matter are being used to develop dosimeters that will assess biological damage from low-dose radiation and to control quality in the irradiation of foods.

Electronic measurements in the gigabit per second range have provided fundamental understanding that NBS is using to develop a new, much more accurate, convenient, and less expensive basic standard for the volt that is based on an array of Josephson junction devices.

The $7.5 million remaining in the Competence Fund will allow NBS to begin approximately 5-10 new projects totaling $1-2M beginning in fiscal year 1988 and every year thereafter.

Question 6. We are interested in the possibility that the international computer networking research now being performed by the Bureau's Computer Institute might be largely transferred to a new private concern, the Corporation for Open Systems.

What is the precise mission of the new Corporation? Who are its members, how much money has it raised, what Bureau work will actually be transferred to it, and what remaining role the Bureau will retain if the transfer occurs?

Answer. The Corporation for Open Systems (COS) is a consortium which was recently formed to accelerate the development and testing of products based on OSI standards. COS will coordinate its member companies efforts in standards implementation, testing and certification. It will work through established standards bodies to expedite the development of standards, and will work to establish a single set of test methods and certification procedures. COS members include IBM, AT&T, Burroughs Corporation, Control Data Corporation, DEC, Honeywell, NCR, Sperry, Wang and Xerox. Membership is open to vendors and users of computer and telecommunications products and services. COS has a $4M annual budget. It is our view that COS can replace the Federal effort of $2.5M.

QUESTIONS OF SENATOR ROCKEFELLER AND THE ANSWERS

Question 1. I have become very interested in what our scientists have been accomplishing in the area of new materials, particularly advanced ceramics. I was very pleased to note the NBS budget included an increase for advanced ceramics. And I cannot agree more with your assessment of its importance. However, in looking at the 1987 Budget Request History Table, I noticed you had requested $7.7 million for high performance composites.

How was this reduction in your budget request affected the new materials efforts at the Bureau?

Answer. Existing levels of effort will not be reduced. Steel processing, ceramics, composites, welding, and non-destructive evaluation using techniques made possible by the proposed cold neutron guide hall are among the areas of growing interest. The realities of limited budgets have required that priorities be assigned to these programs and the composite initiative could not be expanded.

Question 2. What is your view on the importance of the new materials field, both here at home and with respect to our position in the world market.

Answer. NBS recognized the increasing importance of materials to the Nation by elevating the Center for Materials Science to the level of a major organizational unit and renaming it the Institute for Materials Science and Engineering. This new role will enable the Institute to better maintain its scientific visibility and strengthen its technical units.

Industrial materials are now an area of worldwide competition in which the U.S. is no longer a clear leader. Commercialization of these materials is proceeding rapidly in Japan and Europe.

As the manufacture of high-technology, high-value added materials such as composites, ceramics, polymers, and metals takes the place of the historical basis for materials, NBS will need to provide the technical underpinings that U.S. industry will need to succeed in the highly competitive environment that lies ahead.

The proposed cold neutron research facility is very important to this endeavor. Research areas that can greatly benefit from cold neutron experiments include some of today's most competitive fields, biotechnology, advance ceramics, catalysis, and semiconductor technology.

Question 3. If the composite initiative were funded, how would these funds be spent? What specific activities would you undertake?

Answer. The proposed increase of $7,700,000 would have been used to develop measurement methods and standards, key data and models for U.S. industry to produce and use metal, ceramic, and polymer matrix composite materials more reliably.

Question 4. I am firmly convinced that unless we commit ourselves to training a skilled and adaptable NBS work force and to maintaining our preeminence in science, we will not unable to compete in an increasingly technological world. The budget before us however, calls for a drastic reduction in the Research Associate Program at the Bureau for 1987. You have stated in your testimony that 8 new two-year fellowships per year for a total of 16 will be preserved and that you will concentrate in recruiting in the "high priority programs."

Are we not undermining NBS' competence by virtually eliminating one of the best sources of recruitment for the Bureau?

What will happen to research not in the "high priority" areas such as steel, robotics, etc?

It is my understanding that about 50% of the postdoctoral research associates remain at the Bureau. If this program is cut, how do you expect to continue your recruiting efforts to ensure the flow of young scientists to the Bureau?

Answer. The proposed reduction in the postdoc program does not eliminate recruitment through this mechanism but rather reduces our reliance on it. In future years, NBS will award approximately 6–8 two-year fellowships per year. Additionally, NBS will continue to hire additional PhD graduates based on interactions maintained with many universities in all aspects of NBS research and standards programs. NBS also plans to intensify the hiring of PhD graduates in selected program areas, such as ceramics, fiber-optics, and and cold neutron research as represented by requests for budget increased in these areas.

Senator GORTON. Dr. Merrifield.

(Pause)

Dr. Merrifield, just as you came up a roll call started, and since I have an opportunity to read your statement, perhaps you would give your statement here to the staff and go through it. I will run off and vote and be back very shortly after you have finished it. We will then be able to go into our questions.

I apologize for the disruption, but I want to have as much time for questions as possible, so why not go ahead while I go out for this vote.

STATEMENT OF DR. D. BRUCE MERRIFIELD, ASSISTANT SECRETARY FOR PRODUCTIVITY, TECHNOLOGY AND INNOVATION, DEPARTMENT OF COMMERCE; ACCOMPANIED BY JOSEPH F. CAPONIO, DIRECTOR, NATIONAL TECHNICAL INFORMATION SERVICE

Dr. MERRIFIELD. I would like to request that my written statement be included in the record, and I will summarize.

Senator GORTON. It will.

Dr. MERRIFIELD. There have been quite a number of studies by major groups, the Presidential Commission on Industrial Competitiveness, the Business Higher Education Forum and others that have made marvelous recommendations for what is required to recapture industrial technical leadership in this country for impacted areas and to maintain that leadership.

About 90 percent of those recommendations have been approved by Cabinet councils and the President as administration policy. The purpose of OPTI, the Office of Productivity, Technology and Innovation, has been to try to implement some of those recommendations. It is essentially the only agency that has been specifically chartered to try to do that.

We have had some success. The R&D limited partnership model for which we produced guidelines in late 1982 has since developed about $3 billion of private sector funding for R&D. About 80 percent of that has been going into small businesses.

The National Cooperative R&D Act of 1984 modified the antitrust laws to allow collaborative efforts among companies to develop advanced technology that is required for leadership. Since those laws were passed and went into effect, something like 40 major consortia have formed and registered with Justice.

A number of those were catalyzed by our office, and we are currently catalyzing others. Among them is the smart house project by the National Association of Home Builders. It is going to involve about 30 companies and $30 million of funding. It is expected to have a major impact on the building industry.

The legislation has already been passed, and currently additional legislation is proposed that will eventually release tens of billions of dollars of Federally funded technology into the private sector for the first time.

There are 28,000 Government patents. Only 4 percent have previously been licensed. Ninety-five percent of the federally funded technology, of course, is unclassified and has tremendous potential for commercial development. The licensability of that technology now into the private sector could make a big difference.

Binational industrial research and development arrangements have been worked out with other nations, the first with Israel has been phenomenonally successful; others now have been developed with India and most recently France. Currently we are talking with approximately 35 other countries around the world.

Basically the idea here is to develop joint venture relationships between small businesses in the United States and businesses in other countries to open up foreign markets to our small businesses that do not otherwise know how to market outside the United States and to multiply the market potential for new developments. That is a very active program.

We have been developing state and local industrial profiles to help states and local communities develop incubators and identify the strategic opportunities that are presented in each of their areas.

We have been developing interfirm productivity comparisons to allow companies to identify where they are relative to their peer group and to identify where they could improve themselves.

The National Technical Information Service, of course, is a very important element of our work. We have been developing this, and Dr. Caponio is here with me to comment further. The intent here is to develop a one-stop world scan data base which will access maybe 80 or 90 percent of the useful technology around the world, much of which is now being developed outside the United States and has tremendous potential for our own industrial operations. That is a very important initiative.

Of course, we have a series of other thing, including a voluntary metric program, a national technology medal. We have a productivity center that responds to thousands of request for information on productivity from many, many businesses.

There are other services that we have provided, but the administration now feels that these initiatives have progressed to the point where the private sector or other agencies can now pick them up. In the interest of budget reductions, the administration now feels that it is appropriate to discontinue this office.

That completes my statement. I will be happy to answer any questions.

[The statement follows:]

Statement of D. Bruce Merrifield, Assistant Secretary, Productivity, Technology and Innovation, Department of Commerce

Mr. Chairman, the overall PTI (Productivity, Technology, and Innovation) program consists of the Office of Productivity, Technology and Innovation, or OPTI, the National Technical Information Service, or NTIS, and the Office of Strategic Resources, or OSR. We are proposing today that the authorization for the Office of Productivity, Technology, and Innovation, or OPTI, be reduced from $1,805,000 FY 1986 to $1,510,000 in fiscal year 1987. OPTI's appropriations in fiscal year 1986 were $649,000 below OPTI's FY 1985 operating level in addition to the 4.3 percent Gramm-Rudman-Hollings reduction. The money for fiscal 1987 is to be used for a phase out of OPTI. The Department may provide for a small executive staff to advise the Secretary on technology and innovation issues beginning in fiscal year 1988.

We believe that termination of OPTI is appropriate now since it has successfully completed its major tasks, specifically:

By the passage of the National Cooperative Research Act of 1984, a major antitrust barrier to cooperation in R&D among U.S. companies has been removed; already about 40 consortia have notified the Federal Trade Commission and the Department of Justice pursuant to this new law.

OPTI's Industrial Technology Partnerships Program has helped to stimulate over $3 billion of private sector R&D financing through the use of research and development limited partnership (RDLPs) in the last several years. Prior to this time, the RDLP mechanism was not a significant contributor to innovation. The private sector financial community is now taking more and more initiative in innovative financing mechanisms.

OPTI's Federal Technology Policy program succeeded in drafting and obtaining approval of a Presidential Memorandum that makes contractor ownership of inventions government-wide policy. Provisions were included in P.L. 98-620, which extends the principle of contractor ownership to some of the largest government-owned, contractor-operated laboratories.

Through an interagency process, OPTI reduced the need for Federal interagency metric coordination functions by developing and publishing the unified federal policy on metric conversion in the Federal Register on July 5, 1985 and implementing guidelines in the Code of Federal Regulations on January 9, 1986.

OPTI completed 10 major technology/business assessments in key technologies.

OPTI developed a new system for State economic profile analyses to help States pursue their economic development objectives, an initiative that appears suitable for private sector organizations to undertake.

I have attached to my testimony a detailed list of OPTI's recent accomplishments in accordance with your request.

A small OPTI staff may be retained to continue to function as the Department's focal point on policy matters involving productivity, technology and innovation; assist the private sector to form cooperative R&D ventures and assist private efforts to foster new international technology-based joint ventures between U.S. and foreign companies especially small business, based on the very successful BIRD Foundation model with Israel.

Regarding the National Technical Information Service (NTIS), its self-funding activities facilitate the transfer of technology to U.S. firms and are of crucial importance in enhancing the ability of U.S. business to compete more effectively in world markets. NTIS service as a clearing house for the collection and dissemination of government-sponsored and certain foreign-originated scientific, technical and engineering information. In fiscal year 1985 NTIS sold approximately 460,000 copies of documents in paper and 2.1 million in microfiche. NTIS also operates an active patent licensing program whose activities generated $1.15 million in revenues to the Treasury, an increase of 38 percent over FY 1984. That patent licensing program relies on some appropriated funds and retention of licensing fees to assist in recovering costs of the licensing program. The balance of the receipts are returned to the U.S. Treasury. The current policy calls for using fees to offset more of the costs, allowing the appropriation request to be reduced each year. Therefore, the appropriation request has declined from $543,000 in fiscal year 1985 to our request for $443,000 in fiscal year 1987. With respect to the future of NTIS, we plan to complete by September a study which will include an analysis of numerous options to privatize NTIS. At the moment, comments on the study results would be nothing more than pure speculation. Dr. Caponio, the Director of NTIS, is with me today, and will be pleased to provide additional details on NTIS.

You also asked me to discuss the anticipated disposition of the Office of Strategic Resources (OSR).

Section 5c of the National Materials and Minerals Policy, Research and Development Act of 1980 requires that the Secretary of Commerce conduct an initial materials needs case study and such additional case studies as necessary. OSR completed two studies, one on the U.S. aerospace industry and one on the the U.S. steel industry. A third study on domestic mining and processing industries is in process. Further studies by government are not necessary. Any other case studies for which there is a private sector need will be left to private sector initiative.

The director of OSR has been responsible for internal coordination of materials matters within Commerce. Further coordination by OSR is unnecessary. The director of OSR has also been responsible for external interagency coordination. A representative of the Institute of Materials Science and Engineering of the National Bureau of Standards will assume these functions.

A representative of OSR chaired the interagency working group directing the National Defense Stockpile Quality and Form Assessment Program. That group, with the help of industrial experts, has completed assessments of cobalt, chromium, nickel, vanadium, niobium and tantalum, and is about to begin assessments of germanium, 14 minor metals for high technology aerospace and electronic applications, and fibers for aerospace composite applications. Once these are complete, we expect that the private sector will update the information as needed.

In conclusion, Mr. chairman, I would like to emphasize that technological innovation and productivity enhancement remains as critical as ever to our economic growth, the development of new jobs, and the competitiveness of our industry internationally. To regain and maintain world economic leadership, the United States must capitalize effectively on its natural advantages, especially its great breadth and depth of scientific research and its unparalleled entrepreneurial culture. To do this, Administration policy will continue to be directed at promoting cooperative efforts, and removing barriers to increased productivity and innovation.

Thank you, Mr. Chairman, I will be happy to answer any questions.

Voice: Thank you. We will resume when the Senator gets back.

[Bbrief recess.]

Senator GORTON. Thank you, Dr. Merrifield, for helping us expedite the hearing.

I would like now if you would give the committee an overview of the OPTI's major accomplishments over the last year.

Dr. MERRIFIELD. I just briefly did that, but basically some of the things that we have been doing include developing industrial technology partnerships using the R&D limited partnership model as a funding device.

About $3 billion of private sector funding has developed since late 1982 when we got the guidelines out for the RDLP concept. There are about 40 major consortia that have recently formed just in the last year or year and a half primarily as a result of the passage of the Cooperative R&D Act of 1984 that modified the antitrust laws to allow collaborative efforts for the first time.

We have catalyzed a number of those. One of them, of course, is the smart house project which is now registering with Justice, and they hope to see that as a billion dollar industry over the next period of years.

We are currently working with the Department of Agriculture to develop a similar kind of concept to diversify agriculture away from food products into industrial products.

Our problem here is that our major export business, $43 billion in 1981 down to $29 billion last year, could be virtually disappearing in the next five to ten years as developing countries take advantage of their cheap labor and are now growing more food and cotton and tobacco than they use.

So that market will tend to disappear with a major impact, obviously, not only on the farmers and the agricultural areas but the farm machinery business, the John Deere and the Caterpillars, and also the chemical manufacturers, the fertilizers, the herbicides, the pesticide business.

So the importance, then, to the national interest is to get collaborative efforts going using advanced technology, (genetic manipulation) to develop industrial products that will expand and diversify that market.

These are the kinds of things we have been working with, and currently we are beginning to do one with the semiconductor business. It is unthinkable that we exit that business. Again, the infrastructure that is dependent upon that is very pervasive, not only in telecommunications and super computing in automobiles and so forth but downstream into specialty materials manufacture, and the faculty and teachers and so forth.

So these are the kinds of things we are trying to catalyze using the limited partnership model but also the changed antitrust laws which allow these now for the first time.

The binational industrial R&D joint venture concept that we first modelled with Israel, has been phenomenally successful aover the last 4 or 5 years, and now has been recently cloned with India and also with France. I am talking with about 35 other countries around the world. We will probably have a number of those going within the next period of months.

Basically the concept here is to couple small U.S. business with foreign nation companies to jointly develop new technology, opening access to foreign markets for our small businesses that basically do not know how to do that, but also multiplying the market potential for a given new development.

We have developed an intern program, a constraint analysis that identifies the probability of commercial success of new technology that gets about eight or nine out of ten successes. That is what we have been using with the binational industrial R&D programs. We have been using these in joint efforts with state and local communities to develop incubators. There are approximately 100 incubators over the country now forming.

Also we have been developing State and local profiles, industrial profiles, to identify opportunities within states for strategic efforts and providing some of the service functions including identification of the nature of the technology process and how to manage that process. So we have been working with the State and local people to do that sort of thing.

Of course, we have the voluntary metric program to metrify the United States, at least the industrial part. Metric systems are the international standard, and the Common Market will not accept anything outside metric systems by 1989. Of course, the United States is only one of three countries in the world that is not on metric systems. The others are Burma and Brunei, a little principality in Borneo.

We have set up the national technology medal and had the second awards of those recently.

We have a productivity center that responds to thousands of requests for productivity information, and we have developed interfirm productivity comparison profiles for individual companies in specific industries so that they know where they stand in terms of their productivity relative to those of their peer group.

Those are some of the things that we have been doing, and basically as I pointed out the administration now feels that progress has been sufficient in these areas that in the interest of budget reductions the purpose for OPTI implementing many of the recommendations that have been made by the PCIC and other organizations has been essentially completed and it is time now to phase it out.

Senator GORTON. I must comment, and you need not reply, Dr. Merrifield. That is sort of like the legenday proposal at the end of the 19th Century to close the patent office because everything had already been invented.

We will deal with that as a policy matter later.

The Stevenson-Wydler Act, section 5, directs the Secretary of Commerce to establish and maintain an office of industrial technology. That office's duties are to evaluate technological developments and problems and to evaluate the government's role in promoting innovation.

Congress has regarded OPTI as that office. How can OPTI be eliminated without violating the Stevenson-Wydler, and how specifically will the Secretary perform those functions without your organization?

Dr. MERRIFIELD. There are a few mandated policy funcutions—the patent policy which hopefully with the current legislation will be essentialy completed, the metric function which hopefully can be picked up in the private sector and perhaps with some coordination from surviving agencies.

Hopefully most of these issues are expected to be picked up now by other agencies or in the private sector. The plan for doing that has not yet been developed so I cannot specifically say what would happen in any specific situation.

Senator GORTON. Can you speak about these programs, the national technology medal, Office of Metric—well, you did mention the Office of Metric Programs—the Office of Strategic Resources?

Dr. MERRIFIELD. Again, the Office of Strategic Resources has completed two of its three studies, and the third one will be completed sometime this year.

Senator GORTON. Before this will take place?

Dr. MERRIFIELD. Yes, and it is believed that others are not necessary now, and that they could be phased out, too.

Senator GORTON. Either we will violate the provisions of Stevenson-Wydler or in the course of acting on this recommendation we will have to amend or repeal it, will we not?

Dr. MERRIFIELD. We would have to?

Senator GORTON. Amend or repeal that act?

Dr. MERRIFIELD. I guess that is a matter of judgment, a value judgment whether or not the initiatives here are continuing to be valuable and important.

The thought, I believe, in the administration is that residual functions can still be managed under that act but by surviving areas in the Commerce Department or in the private sector.

Senator GORTON. Doctor, thank you. I have additional questions which I will submit to you in writing, and I believe that Senator Gore will, as well.

We would appreciate your responding to them with reasonable promptness because we are going to want to proceed forward with this authorization.

Thank you very much for coming.

Dr. MERRIFIELD. Thank you very much, Mr. Chairman.

Senator GORTON. We now have a panel consisting of Messrs. England, O'Grady, Collins and Epling, if they will step forward.

Mr. England, you are first on the list. I note that each of you has a good statement here. Your statements will be included in the record as if read in full.

We would greatly appreciate your trying to summarize them in five minutes so that we will have some chance to question you. I warn you, as the others, that the buzzer is likely to go off at any moment again, so if we can get through them quickly I would love to be able to ask some questions and not have to wander off to the floor.

Please go ahead.

STATEMENTS OF PETE ENGLAND, IMMEDIATE PAST PRESIDENT, NATIONAL CONFERENCE OF STANDARDS LABORATORIES; JOSEPH G. O'GRADY, PRESIDENT, AMERICAN SOCIETY FOR TESTING AND MATERIALS; NORMAN D. COLLINS, VICE PRESIDENT AND GENERAL MANAGER, BOEING SUPPORT GROUP, BOEING COMPUTER SERVICES; AND WILLIAM Y. EPLING, VICE PRESIDENT, GOVERNMENT AFFAIRS, AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC.

Mr. ENGLAND. Thank you, Mr. Chairman. I also want to thank you for providing the opportunity to verbally express the concerns of our organization regarding the proposed Fiscal Year 1987 NBS budget.

The National Bureau of Standards was created in 1901 for economic purposes and remains today the only Federal laboratory whose mission is to serve the needs of American industry.

Yet, the blunt fact is that many of us are unable to meet the measurement and calibration needs of our parent organizations because the National Bureau of Standards has not been able to provide us with the vital measurements and standards and services.

Certainly part of the present plight of the Bureau lies in its inability to obtain adequate Congressional funding. As I stated before this subcommittee last year during the fiscal year 1986 budgetary hearings, the Bureau's budgets have remained essentially flat over the last two decades in constant 1965 dollars. This, during a period of unprecedented advances in science, technology and manufacturing and more recently during a time when the stated objectives of the current administration include, among other things, increased international competitiveness and the stimulation of productivity, economic growth and recovery.

Why has this been permitted to happen? We believe—in our organization—that part of the cause is that measurement accuracy and the role of the NBS are taken for granted. More glamorous endeavors are often embarked upon which sublimate the one area at NBS which is the reason for its creation in the beginning; that is, measurement and calibration services.

These other endeavors may be important, but we are convinced that nothing will destroy our economy more surely and inexorably than the hidden deterioration of the U.S. national measurement system. The deterioration we have seen over the past two decades, essentially a failure to keep pace in most areas of measurement, has not been corrected by the minimum funding levels provided during the past few years.

As we heard earlier this morning, last October the House Subcommittee on Science, Research, and Technology held special hearings on the future roles and missions of the National Bureau of Standards.

The Department of Commerce Deputy Secretary, Clarence Brown, appearing before that subcommittee, testified that the NBS was developing three initiatives of importance to the measurement and calibration community: one, a $6.3 million millimeter and microwave initiative; two, a $6.1 million process and quality control initiative; and three, a $10 million fiber optics electro-optical initiative.

His remarks noted that these three initiatives were among the top five in priorities as indicated by a visiting committee poll, and yet here we are in April with a budget proposal which has no funding at all for two of these initiatives and only a token amount for the third.

Our organizational concerns are two: first, that through Gramm-Rudman or other means the base funding for NBS are not reduced or that funds previously earmarked for measurement and calibration services are not traded off or reprogrammed to other more politically visible tasks at the Bureau; and second, that there is insufficient funding in the proposed budget for these three measurement initiatives.

I would therefore recommend, Mr. Chairman, that this subcommittee consider the five following actions:

Number one, assure the continuation of all existing base funding for the Bureau's measurement and calibration services;

Number two, restore a minimum of $2.4 million of the requested $6.3 million for process and quality control;

Number three, restore a minimum of $2.1 million of the requested $6.3 million for the millimeter and microwave initiative;

Number four, increase by $1.95 million the proposed budget of $950,000 for fiber optics and electro-optical initiatives; and I might add that that particular initiative had originally been proposed last year at $10 million; and

Number five, increase by $1.6 million the proposed budget of $900,000 for the NBS postdoctoral program. That would put that back at the fiscal year 1986 level.

Now, our written testimony that we provided earlier provides the rationale for these minimum recommendations.

In covering my last point, it has been suggested by some that the private sector consider alternatives to Federal funding of this vital national resource. The suggestion has long-range potential, and approaches could extend from privatizing some of the functions of the National Bureau of Standards to the creation of a consortium of private sector organizations.

Now, the pursuit of such a suggestion, however, is expected to be difficult and to address many complex issues. The NCSL organization would certainly support the suggestion that Congress ask the Secretary of Commerce or the Director of NBS to investigate all funding alternatives and report recommendations back to this committee.

I would like to discuss that further, but in the interest of time I will close and say that concludes what I had to recap of my previously submitted written testimony, and I would certainly welcome any questions that you might have in that regard later or now.

[The statement follows:]

STATEMENT OF PETE ENGLAND, IMMEDIATE PAST PRESIDENT OF THE NATIONAL CONFERENCE OF STANDARDS LABORATORIES

Good afternoon Mr. Chairman and members of the sub-committee. I am appearing today on behalf of the industrial membership of the National Conference of Standards Laboratories; the users of the calibration services of the National Bureau of Standards. Thank you for providing us this opportunity to express the concerns of the measurment community regarding the proposed 1987 budget for the NBS.

The National Bureau of Standards was created in 1901 for economic purposes and remains today the only Federal laboratory whose mission is to serve the needs of American industry. And yet, the blunt fact is that many of us are unable to meet the measurement and calibration needs of our parent organizations because the Nationall Bureau of Standards has not been able to provide us with vital measurement standards and services.

Certainly, part of the present plight of the Bureau lies in its inability to obtain adequate congressional funding. As stated before this subcommittee last year during the FY 86 budgetary hearings, the bureau's budgets have remained essentially flat over the last two decades in constant 1965 dollars. This during a period of unprecedented advances in science, technology and manufacturing. And more recently, during a time when the stated objectives of the current Administration include increased international competitiveness and the stimulation of productivity, economic recovery and growth! Why has this been permitted to happen?

We believe that part of the cause is that measurement accuracy and the role of the NBS are taken for granted; more glamorous endeavors are often embarked upon which sublimate the one area at the NBS which was the reason for its creation in the first place: measurement and calibration services. These other endeavors may be of importance, but we are convinced that nothing will destory our economy more surely and inexorable than the hidden deterioration of the National Measurement System. Both our National Measurement system and the National Bureau of Standards are almost invisible to the public; yet, the importance of these—particularly the NBS-is inestimable.

Occasionally, measurement and calibration are visible to a wider sector of our population. For instance, after the recent Challenger disaster, one member of the President's Commission—Professor Richard Feynman—highlight the measurement of temperature on the external surface of the Solid Rocket Booster. That temperature was reported to be 9° F, significantly lower than the air temperature and any temperature for whch the Solid Rocket Boosters had been qualification tested. These low readings were disregarded, it was reported because they weren't believed. Professor Feynman showed that the readings were creditble (and should have been believed) by demonstrating a simple calibration technique.

Measurements and their underlying calibrations are taken for granted by the vast majority of Americans, just as the millions of other measurements associated with production and readiness inspection of each shuttle were (or had been) taken for granted. Until something goes wrong, most measurements made in research, production and trade are taken for granted. The deterioration we have seen over the past two decades—essentially a failure to keep pace in most areas of measurement—has not been corrected by the minimum funding levels provided during the past few years. A continuing decline in the measurement and calibration services of the Bureau will assure an increase of "things going wrong"—thing which will become obvious to an increasing number of industries and individuals.

Last October, the House subcommittee on Secience, research and Technology held special hearings on the future roles and missions of the National Bureau Standards. The Department of Commerce Deputy Secretary, Clarence Brown, Appearing before that Committee testified that the NBS was developing three initiatives of importance to the measurement and calibration community; millimeter/microwave measurement standard and calibration; process and quality control measurement standards and calibration; and fiber optics/electro-optical measurement standards and calibration. His remarks noted that these three initiatives were among the top five in priority as indicated by a Visiting Committee poll. And yet, here we are in April with a budget proposal which has no funding at all for two of these initiatives and only a token amount for the third. This for three initiatives which had been among the five highest priorities reported by the Deputy Secretary.

Our concerns are two: First, that through Gramm-Rudman or other means, the base funds for the NBS are not reduced or that funds previously earmarked for measurement and calibration services are not traded-off or reprogrammed to other more politically-visible tasks at the Bureau; and, second, that there is insufficient funding for these three measurement initiatives.

The minimum funding requirements to begin the vital work described in the three initiatives meantioned by the Deputy Secretary are as follows:

1. *Process and Quality Control.*—The House hearings last October established that this initiative would require $6.1M; the proposal before you has no funding at all for this essential undertaking. Without at least $2.4M for 1987 (which covers only six of the 21 vital measurement needs indicated in previous reports), the effort started in the last few fiscal years to slow the deterioration will have been for nought. The six measurement areas and their required funding amounts (as verified by our National Measurement Requirements Committee) are:

Prority and project	*Thousands*
1—Primary Frequency Standard R&D	$410
2—High-Pressure Measurements	280
3—AC & DC Voltage	415
4—Radon Measurements	226
5—High-Temperature Thermometry	163
6—Low-Frequency Measurements	878
Total	2,372

As can be seen from this list, the projects support a wide spectrum of American industry as well as the health and safety of American workers.

2. *Millimeter and Microwave Standards and Calibration.*—This initiative was proposed in the October House hearings at $6.3M for FY 1987; the budget before you has noting. Although potentially benefitting from other agency funding (in particular the DoD), solution of the problems included in this category require not only an increase in the DoD component but direct Congressional appropriations as well. A minimum Congressional apropriation of $2.1M is necessary to maintain the momentum provided by actions taken this year. This minimum level of funding would allow inititation of work on 18 projects and accelerate work on the 19 most vital ones of the IEEE's list of 75 projects important to both industrial and defense users of millimeter and microwave measurements and standards. While far short of real needs, these funds would at least provide for coverage of the four highest priority groups with tolerable completion schedules.

3. *Fiber Optics/Electro-Optical*—Although a token amount of $950K has been proposed in FY 1987 for this initative, the House hearings last October disclosed a need of need $10M for the same period. To meet minimum needs in this area, this initiative needs to be funded at $2.9M. This amount, together with the $750K of internal transfer reflected in the proposed budget, would assure that a very modest approach to the solution of measurement problems in optical communications systems would be begun (e.g., laser sources, optical detectors, planar waveguides, switches, modulators and multiplexers).

The successes of the Bureau in the past—and we believe those that will occur in the future—absolutely depend on the existence of a competent staff of scientists. One way that young scientists have been attracted to the measurement science field has been the highly successful NBS post-doctoral program. We were dismayed to see that this important element in the development of future senior scientists in measurement research has been significantly reduced from the FY 1986 level. It is recognized that some envision this post-doctoral program as an NBS recruitement exercise when in fact it is a highly leveraged investment in Amercian industry. Therefore, we recommend that this Committee restore the post-doctoral program to the FY 1986 level of $2.5M.

We have said before that the process involved in establishing the Federal budget—which assigns priorities among competing users of federal funds—is properly a political one to assure that broad National interests are served. We agree that political decisons should be made with as much information as is possible, particurlary regarding the impact of failing to fund certain Federal programs. An element as small in the total Federal budget as the National Bureau of Standards contains a variety of even smaller components which will result in standards and services essential to Government and industry. As a support function with little political visibility, it is extremely difficult to make a case for increases in bugets for the NBS—at least until something goes wrong. Erosion of the basic measurement reference system is a process which, if allowed to continue, will ultimately have catastrophic effects on our economy. Naturally, the first sectors to see this impact will be high technology and defense areas; as previously noted, some of these effects are already being felt. As deterioration continues, the impact will pervade all other sectors finally including even everyday consumer affairs.

We therefore strongly urge what this Committee: (1) assure continuation of all existing base funding for measurement standards and calibration services; (2) restore the Process and Quality Control and Millimeter/Microwave initiatives; and, (3) increase the funding to the Fiber Optics and Post-Doctoral programs to the minimum levels indicated:

	Millions
Process and Quality Control	$2.4
Millimeter/Microwave	2.1
Fiber Optics/Electro-Optical	[1] 2.9
Post-Doctoral	[2] 2.5
Total	9.9

[1] Includes $950K already contained in the proposed budget.
[2] Includes $900K already contained in the proposed budget.

It has been suggested that the private sector consider alternatives to Federal funding of this vital national resource. The suggestion has long range potential and approaches could extend from "privatizing" some of the functions of the National Bureau of Standards to the creation of a consortium of private sector organizations. As we expect the national standardizing laboratory of any nation to be independent and of high repute, the pursuit of this suggestion is expected to be difficult and address complex issues. Even so, in this crisis with our National Measurement Sytem, all possible long-term solutions must be explored.

Accordingly, the NCSL organization would support the suggestion that the Congress ask the Secretary of Commerce or the Director of the NBS to investigate such alternatives further and report recommendations back to this Committee.

We thank you for opportunity to provide information regarding the NBS budget and would welcome any questions.

Senator GORTON. Thank you.

Mr. O'Grady.

Mr. O'GRADY. Thank you, Mr. Chairman. My name is Joe O'Grady. I am president of ASTM, and I think I can do it without the microphone if the young lady can hear me.

Senator GORTON. Why can you not put the microphone in front of you? The people in the back of the room certainly cannot hear you.

Mr. O'GRADY. ASTM appreciates the opportunity to be here today to document for the record our very real concerns over certain trends in the proposed 1987 budget for the National Bureau of Standards. These concerns, Mr. Chairman, are no different than the concerns we expressed last year and for essentially the same reasons.

Before I get started I would like to just briefly tell you, for the record, just what is ASTM, formerly known as the American Society for the Testing of Materials. It is the leading standards organization in the world for the development of voluntary consensus standards for materials, products, systems and services.

These standards, which include specifications and test methods and recommended practices, are marketplace tools used by industry to buy and sell in procurement. They are also becoming more and more popular in use by Federal and State agencies. Many of these standards, especially the test methods, find themselves being referenced in government regulations.

The ASTM system consists of 140 technical committees. We have 29,000 members throughout the world, more than 3,000 of which are from overseas. We deal in such complex subjects as ferrous and nonferrous metals, ceramics, waste disposal, and construction materials. We deal with standards on petroleum, textiles, fire standards, medical services, biotechnology and consumer products.

So you can see we have a very wide range of activities. This has been a very successful organization over a period of as many years as has been the National Bureau of Standards, which brings me to the point, Mr. Chairman, that imbedded in so much of the work of ASTM are the outstanding contributions made by the National Bureau of Standards as members of these technical committees in producing the kinds of documents that are used both nationally and internationally and from which American industry derives very, very significant benefits.

So I agree with Mr. Brown before when he said NBS is doing a fine job. There is no question in my mind, based on my association with this organization for a great many years, that they do do a fine job.

Last year in our testimony before the House committee we stressed the importance of Federal Government participation in the voluntary system. We cited the Bureau's significant contributions at that time in the preparation and production of the documents to which I have just referred.

We have 288 members of the National Bureau of Standards at this time who assist us in the preparation of all of this material, including another body of material called special technical publications and other publications which form a base of higher technology in areas such as biotechnology, fracture mechanics and other things.

We do recognize the important contributions made not only by the Bureau but other Government agencies in the performance of this very important work.

Now, Mr. Chairman, we understand the movement to transfer certain Federal Government activities to the states and private sector, especially in light of the Gramm-Rudman legislation and other deficit reduction activities.

With all due respect to that point of view, we believe that the organization and mission of the Bureau are essential building blocks, not only in standards development and subsequent industrial growth. We believe that that institution should be preserved.

The technological infrastructure provided by the Bureau offers significant opportunities for government/industry cooperative efforts to strengthen our national competitiveness, and I would like to stress that because it is in this area where international competitiveness requires the serious attention of both the Government and non-Government sectors.

Through the cooperative efforts of ASTM and the Bureau we are achieving that in quality control, in cost reduction and in other benefits which are certainly very, very important to the competitiveness of American industry.

I would like to address certain things which are in the budget this year, Mr. Chairman, to which we believe this committee and the other committee on the other side should give serious consideration.

We strongly support the Bureau's continuing efforts in process and measurements for biotechnology. Although still in its infancy, this genetic engineering technology offers unforeseen opportunities for new chemicals, drugs, foods and other agricultural products. It is an exciting new technology. It has vast implications to American industry, and the Europeans are watching us very closely in this area. So to have the Bureau continue its involvement in this area is essential.

We feel exactly the same way about the new technologies involving such things as advanced ceramics, and my record which will be part of this meeting will reflect that.

ASTM also supports the budget proposal for $10 million to establish a cold neutron facility. Dr. Ambler covered that quite well. We believe, and it is ASTM's position, that this new technology being made available through the Bureau will substantially improve the ASTM ability to produce consensus standards of the kind I previously described.

We also support the budget request for increased funding to improve the productivity of the new consolidated scientific computer system. The proposed streamlining of computer software will provide an enormous new tool for Bureau scientists in pursuit of their technical goals in assisting ASTM.

We are concerned over the proposed decrease in the technical competence in postdoctoral research programs. These people-intensive programs are an essential component of our nation's commitment to training and technology transfer.

As you might expect, Mr. Chairman, ASTM is opposed to the elimination of the Center for Building Technology, and it is opposed to the elimination of the Center for Fire Research as proposed in the budget. Although we would not like to see anything detract from the newer research activities previously cited, ASTM believes that a Federal presence is needed in these areas in addition to existing state and local code programs and possible private sector initiatives.

We believe, however, the Bureau presence through this activity in both the Center for Fire Research and the Center for Building Technology is essential. Today the Bureau remains as an important source in the development of consensus standards for building performance and safety.

I might add that in the building codes there are three of them that are referenced as the model codes and then many variations in those codes throughout the United States all the way from north to south and east to west.

Many, many of the terms and conditions in the building codes are underpinned by ASTM standards, and the Bureau has been an enormously important aspect of that, so the building codes of the United States are at issue here as well as the issue of whether or not the center should be continued.

Finally, Mr. Chairman, how the Bureau has grown and what it has accomplished over the years is a matter of public record. We all know that. It is an institution of the Federal establishment that has both national and international respect for technical excellence, and its potential to even better contribute to the technological needs of our nation should not be undermined because of the concerns which we certainly appreciate involving budgetary restraints.

Finally, Mr. Chairman, ASTM respectfully recommends—indeed we urge—that you reconsider the Bureau's budget for fiscal year 1987 and that funding be restored to the Center for Building Technology and the Center for Fire Research without injury to the new activities the Bureau has listed as high priority.

Thank you very much for your kind attention, and I look forward to some questions.

Senator GORTON. Mr. Collins, you're next, and you are particularly welcome here.

Mr. COLLINS. Mr. Chairman, I want to thank you for inviting the Boeing Company to testify before your subcommittee on the importance of the research and standards setting work of the National Bureau of Standards, and especially the programs of the Institute of Computer Science Technology. The work of these organizations is of vital importance to the Boeing Company. In fact, my boss, Mr. Robert Dryden, president of Boeing Computer Services, had hoped to present this testimony himself but was unable to rearrange his schedule so he could be in Washington, DC today.

I am a vice president of the Boeing Company with specific responsibilities in Boeing Computer Services, which is a division of the Boeing Company with approximately 13,000 employees and sales in excess of one billion dollars. Boeing is recognized as a leader in designing and manufacturing commercial aircraft, aerospace and military products. It also sells electronic products and computer services, and is consistently among the top U.S. exporters.

It has shown it can compete successfully worldwide in many types of markets. While we are a high technology company, our real expertise is as an integrator of high technology systems and subsystems into complex products.

Boeing Computer Services has helped the Boeing Company to be successful by using its technical capabilities to make the company more productive and more cost-competitive, and better able to use that vast amount of technology and technical data that is now being developed here and abroad.

But we were not—and are not now—getting the productivity we feel is possible. This is because it is very difficult to get our own computers to talk to each other. It was, and is, even more difficult to get our computers to talk to those of our suppliers.

It is probably apparent from these remarks that our interest in open system interconnection is partly born of frustration. Of course, Boeing is not alone in being frustrated.

I suspect that General Motors, Kodak, and, for that matter, almost every large company faces similar problems. So did—and does—the U.S. Government and that is one good reason the National Bureau of Standards, as the Government's technical expert in this area, became interested in open system interconnection, or OSI.

Boeing's work with the bureau in getting computers and various other pieces of peripheral equipment built by different manufacturers to talk to each other dates back to 1980. For our part, we supplied research associates to help the Bureau's efforts. We co-sponsored with NBS an open system interconnection demonstration at the 1984 National Computer Conference.

Other companies made similar investments. Fortunately, efforts by the National Bureau of Standards and by industry have been able to resolve some of the problems which have inhibited open interconnection of different pieces of equipment from different manufacturers.

However, many problems remain. In fact, many would argue, justifiably, that we have just begun to scratch the surface. The point is, however, that the Bureau was able and continues to be able to use its offices and its research facilities to complement the technical and practical business capabilities of industry to advance OSI.

Each supports the other, to the mutual benefit of both. As a result of achievements thus far, other key efforts have been spawned. One recent example is a new group that has been referred to today called the Corporation for Open Systems.

Although less than a year old, there were at last count over 40 members. Some are vendors of computer products and some are users. The Boeing Company is a member.

But, this corporation is not a standard-setting body, and contrary to what Mr. Brown has indicated earlier in his testimony, it does not supplant the work of the NBS and the ICST. Rather, it supplements that work. The objective behind the Corporation for Open Systems is to accellerate the introduction of products which conform to the OSI standards and to related international standards.

Another example of OSI-related programs is the Boeing-sponsored development of protocols for technical and office equipment. These protocols are referred to as TOP.

Additionally, our colleagues at General Motors are working with ICST to promote international standards in manufacturing automation protocols, called MAP. Literally hundreds of large and small companies across the country are showing interest in these two developments.

Both General Motors and Boeing are making very large investments in these programs. At Boeing, we, like several other U.S. companies, feel we are doing our part and we have the hope and the expectation that the U.S. Government will be supportive and do what only governments can do, that is, promote these standards in government-related circles both domestically and internationally.

Changing government direction on these issues from one year to the next, as is being proposed, Mr. Chairman, by eliminating ICST funding, would not be helpful in promoting industry-government cooperation. We are depending on the ICST. Without the continued support of the Bureau, progress already made could soon be lost.

Frankly, as a practical matter we would probably have to let the Europeans assume the leadership role in OIS if the NBS were to reduce its efforts. That would not be in the best long-term interest of U.S. industrial competitiveness.

Mr. Chairman, althought the Bureau has accomplished much on a limited budget, the work of the ICST is nowhere near complete. We are at a critical stage. Continued investment in the OSI computer standards work of the Bureau would be money well spent. It would be repaid in terms of increased U.S. productivity and competitiveness in world markets.

As you said in your introductory remarks, Senator Gorton, cutting the budget would increase the budget deficit. It could increase the budget deficit and also the trade deficit. Boeing is itself strongly committed to promoting the OSI concept and strongly supports the related work of the NBS. In fact, Mr. Chairman, I would be very happy to see increased funding for the OSI work being done by the NBS.

Thank you.

Senator GORTON. Thank you, Mr. Collins.

[The statement follows:]

STATEMENT OF NORMAN COLLINS, VICE PRESIDENT, THE BOEING CO.

Mr. Chairman, thank you for inviting The Boeing Company to testify before your Subcommittee on the importance of the research and standards setting activities of the National Bureau of Standards (NBS) and especially the programs of the Institute of Computer Science Technology (ICST) and the Center for Manufacturing Engineering (CME). The work of these organizations is of vital importance to The Boeing Company. In fact, Mr. Robert Dryden, president of Boeing Computer Services, had hoped to present this testimony himself but, as the Chairman is aware, Mr. Dryden was unable to rearrange his schedule so that he could be in Washington, D.C., today.

My name is Norman Collins. I am Vice President of The Boeing Company and of Boeing Computer Services, a division of The Boeing Company with over 13,000 employees and sales of computer services and telecommunications services in excess of $1 billion. I am responsible for providing computing services, equipment and support to the various divisions of the Boeing companies. Boeing is recognized as a leader in designing and manufacturing commercial aircraft, aerospace and military products. It is consistently among the top U.S. exporters and has shown that it can compete successfully worldwide in several markets. Boeing Computer Services has helped The Boeing Company succeed by using our capabilities to make the company more productive and better able to use the vast amount of technology and technical data now being developed here and abroad. That ability, in no small way, relates back to the work of the National Bureau of Standards and its pioneering efforts with industry to get computers of the many manufacturers to communicate with each other.

Boeing Computer Services has been involved with NBS' ICST for several years. Our relationship began in 1980, coincidental with the development of the Open Systems Interconnection, or "OSI" concept. During that period of time we have had many technical exchanges with ICST for the purpose of assuring that the research efforts of that organization were pertinent not just to the federal sector, but to industry in general. Many of those technical exchanges were through NBS workshops conducted by ICST which were intended to lead to specifications capable of being implemented as commercial products. In conjunction with those workshops, Boeing Computer Services co-sponsored, with NBS, and General Motors Corporation, an OSI demonstration at the 1984 National Computer Conference. Other joint activities included the provision of engineers for the ICST research associate program, and participation in the NBS initiated OSINET, a nationwide system intended to further OSI research efforts.

NBS has demonstrated in the past that it can provide services that have a direct benefit to U.S. industry. Based on the Bureau's performance, I believe that additional government funding is well justified in order to meet future needs. As Mr. Dryden, president of Boeing Computer Services, said in a speech delivered to INTECH'85 last August:

"The National Bureau of Standards has been doing a remarkable job of promoting this activity (international data communications standards) under severe political and budgetary restrictions. The leadership at NBS is dedicated and farsighted and deserves our sincere appreciation for their continued perseverance."

The Boeing Company is not alone in expressing appreciation for the work of the NBS.

An outgrowth of our participation in the NBS workshops has been the Technical and Office Protocols project, or TOP, as it is called. The TOP project is a user-driven effort to specify communication protocols for technical and office networks, complementary to the Manufacturing Automation Protocol (MAP) project begun by General Motors for factory floor networks. For these efforts to be successful, it is imperative that the specified protocols not only satisfy user requirements, but be readily implementable by the vendors and testable by independent third parties. These additional technical requirements are being addressed primarily by the research conducted by ICST and by the work performed within the NBS implementor's workshops. Without NBS's continued involvement, the success of programs such as MAP and TOP are seriously threatened.

Boeing alone has already expended millions of dollars in support of OSI, and in 1986 we will more than triple our investment of money and technical resources over our 1986 expenditures.

Recently Mr. David Martin testified before the Subcommittee on behalf of the Corporation for Open Systems. The Corporation for Open Systems (COS) is a nonprofit organization formed by a collection of U.S. computer manufacturers and users. The Boeing Company is a member of COS and strongly supports its objective, which is to accelerate the introduction of products which conform to OSI and related international standards. The keyword is accelerate. With the addition of technical and financial resources infused into this activity through COS, private industry is significantly stepping up efforts to accomplish this objective. COS and each of its member companies are depending heavily on the work of NBS/ICST to achieve their mutual objective. COS does not compete with the NBS. The Corporation, like its members, is not a standards setting body. It does not supplant the work of the NBS and ICST. It supplements it. Each organization supports the other.

The success of the ICST program is testimony in itself, but I would like to take this opportunity to reiterate The Boeing Company's support of the progrram. ICST has been instrumental in advancing the high technology area of computer networking. Computer networking involves the interconnection of computing equipment over communications systems which allow the exchange of data between geographically dispersed systems, regardless of their make. This capability is essential to The Boeing Company to allow it to remain competitive in a high technology world market. The Boeing operating companies are responsible for a diverse range of products, which requires those companies, and organizations within those companies, to purchase computing equipment best suited to their individual pursuits. However, these various organizations have requirements to exchange data among themselves and with subcontractors both here and abroad. ICST has been directly responsible for many of the enabling technologies utilized in effecting this data exchange capability.

Without the results of the ICST program, our European and Asian competitors would be considerably ahead of us in the effective utilization of computer resources. Effective computer utilization is a keystone in modern high technology engineering and manufacturing practices. Not only would our foreign competitors have an advantage in terms of utilization, but without ICST the developing international standards for computer communication systems would be dominated by foreign interests. This would put us at a technical disadvantage when attempting to implement worldwide systems.

In addition to U.S. industrial interests, the ICST programs have been beneficial to the federal sector. The federal government may be viewed as a large user, with problems similar to those encountered in the private sector. The federal government, just as private industry, must continually improve efficiency and cost effectiveness. ICST, through Federal Information Processing Standards (FIPS), channels the results of the international standards efforts into the federal agencies. This standardization will result in steadily increasing cost savings through less expensive standard components, and improved efficiency through greater capability. ICST also assures that federal sector requirements are taken into account in the formation of national and international standards, and through its impact on federal procurement, greatly influences the more rapid availability of these standards from vendors.

There is also an impact on national security in both defense and intelligence operations. Through the development of international standards which take into account U.S. interests, the U.S. Government will be better able to communicate with our European allies, and more likely be able to utilize public communications facilities in the event of emergencies. Intelligence gathering and analysis will also be affected by an enhanced ability to acquire data from various sources, regardless of location or make of system. But I am sure that the experts from the State Department, DOD and the defense community can speak more thoroughly to this issue.

As you can see, the ICST program is vital to government as well as private industry. The task at hand is large and can only be completed by government and industry working together. Private industry is increasing its level of investment in this area, and there is a corresponding need for the level of government funding to keep pace. American industry cannot afford the loss of momentum in the TOP and MAP programs that would result from a reduction in ICST support.

Although the ICST program has been effective, there is still much work to be done in the development of computer networking technology.

Today, thanks largely to the efforts of ICST, we have a demonstrated means on interconnecting various manufacturers' computer systems and effectively exchanging information between those systems. However, this capability is just the tip of the iceberg. Computer interconnection does not resolve the problem of the location of data or resources, or provide for the management and control of the system. Continued work by ICST in those in areas is essential to making these systems work. ICST's unique position of impartiality among the vendor and user communities, combined with its internationally recognized staff of technical professionals, has made it a powerful force in advancing state-of-the-art computer networking technology. Reducing the ICST funding at this point would be a severe setback to the progress that has been made so far and seriously cripple future efforts.

While the ICST program is of particular interest to Boeing Computer Services, The Boeing Company has also been participating since 1984 in the CME's Advanced Manufacturing Research Facility (AMRF) program through research associates and other technical exchanges. This is the only program we know which addresses the flexible automation of small batch manufacturing, which represents the bulk of America's manufacturing capacity. Solving the problems of control and management of an automated factory with distributed computing systems and distributed data requirements is of prime importance to the manufacturing industry. The technology being developed by the Bureau is critical. It will help improve manufacturing productivity and aid in the integration of isolated automated systems into a cohesive Computer Integrated Manufacturing (CIM) enterprise. The result: Improvement in America's competitive position throughout the world.

To summarize, the ICST work in advancing high technology computer networking is already having a positive effect on the ability of U.S. industry to operate efficiently and competitively in world markets, and will have an increasing effect on improving the efficiency and lowering the computing costs of the federal sector. An investment in ICST is money well spent. ICST has assured that U.S. industry and government have been accounted for in the creation of international standards. U.S. participation has obviated the technical problems which would have accrued had the international standards setting functions been left to foreign interests. However, it is imperative that the ICST computer technology programs continue, for without ICST's advanced research and standards participation, our tenuous lead in high technology could soon vanish. In addition, the activities associated with AMRF are absolutely critical to the successful implementation of a total CIM system. To be candid, U.S. industry would chance to lose must of what it has already invested in promoting computing standards and the millions of dollars now scheduled for investment could be to no avail. American industry needs the NBS. The NBS needs American industry. That makes for a good government/industry working relationship.

I am pleased to give my wholehearted endorsement to the ICST computer technology program and to the CME AMRF program. With many other large industral users, The Boeing Company awaits the continued results of the ICST and CME efforts.

Senator GORTON. Mr. Epling.

Mr Epling: Thank you, Mr. Chairman. It's a real pleasure to be given a chance to represent the American Institute of Steel Construction and steel fabricators in support of the Center for Building Technology and the Center for Fire Research.

We've been around since 1921. We've disciplined our industry that builds steel buildings and steel bridges. This is the eighth edition of the design manual that we publish. It's the bible for the design, fabrication, and construction of all steel buildings and bridge in this country, and as a matter of fact throughout much of the Western world.

A little quick summary of the fabricated structural steel industry: there are some 1,100 plants, 53,000 workers, with an average plant having 48 workers. We're an aggregation of small industries.

We use over 5 million tons of steel a year in about a $6 billion industry. In total, then, we're about the size of Bethlehem Steel which is sort of an interesting way of looking at it. We're lots of little fellows. We actually manufacture a custom product that is used in the construction industry.

We are absolutely convinced that cooperation between the Federal Government, university researchers, and industry is essential to make progress in our industry and stay technologically competent. A very good example of this, I think, occurred a year ago in March of 1985.

The National Bureau of Standards, the National Science Foundation, ourselves, the American Iron and Steel Institute which represents the mills or the basic steel producers, and the Metal Building Manufacturers' Association sponsored a 2-day workshop out at the National Bureau of Standards to identify critical research needs and prioritize these needs in a 5-year plan.

Eighty-five people participated: Federal Government, university researchers, design professionals, and the steel industry itself, of course. An excellent example of a research project that was reinforced, not discovered, is the structural connections of the main members on multistory buildings that are exposed to large wind and earthquake loads. These connections are very, very critical to the building's performance under the imposition of these loads.

We have had for several years an ongoing program at the University of Arizona, that we were sponsoring and funding, doing the analytical studies. Bethlehem Steel has picked up and done the computer modeling of the connections for a typical multistory building. They also designed the test set up.

The National Bureau of Standard will begin the laboratory research and testing this spring using a unique testing machine, a tri-directional, computer-controlled device that can impose loads and displacements in three degrees of freedom. The results will be published this fall. They'll go to researchers, to design professionals, and they will appear in the next edition of our design manual that is now in preparation. We think this has very significant implicatiosn for our industry.

This is a good example of the synergism that exists. We're absolutely convinced that we cannot pick up the load by ourselves in, this large but very broad-based industry. We need the help of university research and the National Bureau of Standards, particularly the Center for Building Technology and the Center for Fire Research.

In short, we strongly urge the continued funding of these two agencies. Thank you, sir.

[The statement follows:]

STATEMENT OF THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION

The American Institute of Steel Construction (AISC) is pleased to submit this statement for the record in connection with the hearings of the Fiscal Year 1987 Budget for the National Bureau of Standards (NBS). AISC's statement will focus on the critical need for continued funding for the Center for Building Technology and the Center for Fire Research of the NBS.

The statement provides background information on the AISC and the U.S. fabricated structural steel industry. Our statement then discusses the impact to the proposed Administration action to eliminate funding for the Center for Building Technology and the Center for Fire Research on the U.S. fabricated structural steel industry and upon consumers of steel building frames and bridges.

I. GENERAL BACKGROUND

A. The American Institute of Steel Construction [AISC]

AISC is a unique voluntary trade association uniting the fabricators of steel framed buildings, bridges and related structures. AISC also serves the erectors, designees and educators who have a professional interest in fabricated steel structures. Our headquarters is in Chicago. AISC has three types of membership: Active, Associate, and Professional.

Active membership is open to companies that fabricate structural steel. Only firms headquartered in the U.S. are eligible. Active membership now totals 394 firms.

Associate membership is open to firms or individuals who sell a product or service related to steel construction (e.g., basic steel producers. Associate membership now totals 111.

Professional membership includes firms or individuals practicing as architects or engineers, or teaching either of these professions in a recognized college or university. Professional membership now totals 2,216.

In the early years of steel-framed construction, the growth of our industry was limited by the lack of standard design principles and descriptive product terminology. Producing mills each rolled different sections or shapes and each mill had its own weight load tables and product specifications. In many cases, these were inconsistent with the standards of other mills. This condition had existed for many years and was the fundamental reason the AISC was formed in 1921. The original objectives of the AISC were thus:

1. To establish a single standard construction manual recognized by building code authorities and designers;
2. To establish a set of standard loading tables for all the sections rolled by the various mills; and
3. The establishment of an authority to foster the efficient use of steel that would be welcomed by the mills, engineering profession, architects, building officials and purchasers of steel.

AISC believes it has accomplished those objectives with distinction.

During recent years AISC's traditional strong emphasis on research and engineering has been expanded to encompass a wide range of educational, market research, and producer certification programs. We now have a full time staff of over 50 people and operate under an annual budget of $4.0 million.

In April 1983 we established a full time office in Washington, D.C. to pursue the fabricated structural steel industry's interests before the Congress, the various federal agencies and with related or allied trade associations.

B. The U.S. fabricated structural steel industry

The principal products of the fabricated structural steel industry are steel building frames, bridges and related structures. The leading alternative construction material for these applications is reinforced concrete, which is also widely used throughout the United States. The choice between steel and concrete reflects to a large degree the particular engineering features of each structure, but price is also a very major determining factor.

The structural steel fabricator plays a clearly defined and critically essential role in constructing a building or bridge. The fabricator works with the plans and specifications for the structure prepared by architects and engineers to determine the number and type of fabricated steel pieces that will be needed. Using steel shapes and plates purchased from basic steel producers or steel service centers, the fabricator creates each of the required framing pieces. These fabricated structural steel parts are then properly grouped and transported to the construction site, where the building frame or bridge is assembled by an erecting company.

The U.S. fabricated structural steel industry consists of approximately 1,100 firms, which are typically closely held family businesses. We estimate that the industry now employs approximately 53,000 persons, primarily ironworkers who fabricate steel in our plants. In this sense fabricate means to cut, bend, drill or punch, weld or bolt pieces of steel. These ironworkers are supported by estimators, draftsmen, and management personnel.

An industry employing 53,000 persons among, 1,100 firms is an industry whose firms average 48 employees. Thus, the U.S. fabricated structural steel industry is a large group of small businesses.

Steel fabricating firms typically are independent from the basic steel producers, which themselves generally do not engage in the fabricated structural steel business. Basic steel producers such as the Bethlehem Steel Corporation played a major role in steel fabrication until about 10 years ago but have now largely left our business. It is widely believed that the basic steel firms withdrew from fabricating because their labor structures rendered them non-competitive.

Bureau of Labor statistics data show that employees of the fabricated structural steel industry earn a wage that is about two percent higher than the average national wage rate for industrial workers. About half of our workers are unionized.

Although the U.S. fabricated structural steel industry is separate from the basic steel industry, the economics of the two are closely linked. The fabricated structural steel industry uses some 5 million tons of basic steel per year. As such it is a very important customer of the basic steel industry. Our total business volume amounts to approximately $6 billion per year.

Approximately 55% of the cost of fabricated structural steel products is the price paid for basic steel. Thus, design economy in the amount of steel used and the unit cost of the basic steel affect our competitiveness with foreign fabricated structural steel and with concrete and other materials suitable for building and bridge construction.

II. ISSUE OF FUNDING FOR THE CENTER FOR BUILDING TECHNOLOGY AND THE CENTER FOR FIRE RESEARCH

The Administration's budget for fiscal year 1987 proposes the elimination of the Center for Building Technology and the Center for Fire Research at the National Bureau of Standards (NBS). The American Institute of Steel Construction (AISC) is seriously concerned about this proposal. The fabricated structural steel industry recognizes the centers' important contributions to building technology. We strongly urge that steps be taken to provide continuing federal support for these two centers.

Throughout its 65 year history, AISC has been highly engineering oriented with a strong emphasis on steel research and steel design techniques. It publishes many technical publications including the "bible" of the industry—the AISC Manual of Steel Construction—which contains the well know AISC Code of Standard Practice and the AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings. These documents are the basis for most steel building designs and construction contracts in this country as well in many other parts of the world.

AISC is involved in long range strategic planning to move our industry forward. Technology is one of the five key objectives in our strategic plan. Activities at the NBS are inportant to us in this regard. NBS has a long history of cooperation with the steel industry. For example, NBS has been working with the steel industry for more than 80 years to improve the durability and performance of metals and alloys. Most recently in the structural engineering area, NBS worked with AISC, the American Iron and Steel Institute (AISI) and the Metal Building Manufacturers Association (MBMA) to develop a research agenda for steel buildings.

The Center for Building Technology at NBS took the leadership role in bringing together representatives of the steel industry, federal agencies, design professionals and university researchers. The participants identified experimental and analytical research needed to advance the state-of-the-art and improve safety and economy in the design, fabrication, and construction of steel buildings. They also developed a five-year plan for a coordinated research program. The workshop was sponsored by NBS, AISC, AISI, MBMA and the National Science Foundation. A copy of the workshop proceedings is available for review at the Subcommittee on Science, Technology and Space of the Committee on Commerce, Science, and Transportation.

The concept of government/industry/university cooperation to carry out a coordinated program was endorsed by the NBS workshop. Such cooperation is underway. For example, the Center for Building Technology at NBS, the AISC and the University of Arizona initiated a cooperative research project in 1985 on the behavior of connections for steel braced frames. The project involves large-scale structural connections subjected to loads encountered in buildings subjected to wind or earthquakes.

Analytical studies at the University of Arizona, which have been going on for several years under AISC sponsorship, will serve as the basis for the cooperative project. The experimental program was developed by NBS researchers in consultation with representatives from a special AISC Task Group on Bracing for Heavy Construction and researchers from the University of Arizona. Computer studies of typical braced frame multistory buildings were conducted by the Bethlehem Steel Corporation to provide prototype values for member sizes, stress levels and connection details. These studies were used to design the test set up and select the dimensions of the test specimens to insure that the tests closely simulate the behavior of bracing members and connections in actual structures. The test specimens were fabricated in accordance with current practice by Cives Steel Corporation. The experimental program will commence at NBS later this year. It will utilize unique experimental facilities available in the Center for Building Technology.

We believe this cooperative government/industry/university venture can serve as a model for future cooperative efforts in building research. It draws upon the expertise and resources of the three groups. It also illustrates the vital role the Center for Building Technology with its unique laboratory facilities and technical staff can play in improving building practices in the United States.

The AISC recognized the need for and shares the commitment to reducing the federal budget deficit. However, we believe the services provided by the Centers for Building Technology and for Fire Research at NBS are critically important in providing advanced technology needed for the growth of the U.S. steel construction industry. We strongly urge the Congress to take steps to insure the continuation of the two centers.

CONCLUSION

This statement for the record documents the strong views of the American Institute for Steel Construction, the national voice of the fabricated structural steel industry, on the critical importance of continued funding support for the Center for Building Technology and the Center for Fire Research. Only through the operation of these two centers can meaningful technological progress in steel construction continue.

Senator GORTON. Thank you very much. Mr. England, you mentioned in your testimony that many complex issues would have to be addressed before the private sector could assume the Bureau's role in national standards.

Can you amplify on that, and comment a little bit on what kind of issues could ever be accomplished?

Mr. ENGLAND. My own personal opinion is that, no, it couldn't be accomplished efficiently, and certainly would be risky and difficult and perhaps unworkable. I might offer some general comments and observations in that light.

First off, the research facilities needed to develop measurement technologies and capabilities are capital-intensive, and of course, therefore very expensive. Number two, the engineering and scientific skills that are necessary are not readily available in the private sector, and if they were, I would question whether they could be used as efficiently as they are now under the Bureau's structure.

Number three, American industry's measurement research and development technology is generally narrowly focused and would therefore be narrowly applied, whereas if it's done by the Bureau it can and often is applied across several industries.

I might cite as an example, the Bureau's research in the optical fiber areas wherein this emerging technology has benefited from ongoing research at the Bureau in laser metrology, and as I understand it they are also interfacing now with cryoelectronic metrology.

Now, if privatized, I don't think the benefits resulting from this proximity of resources and shared talent could be achieved as well as it is in the Bureau. And of course, the diffusing and the dissemination of that technology and that research information back to American industry would be likewise just as difficult.

And certainly, the economic factors would make it difficult for any private sector scheme to recover or capture sufficient return on investment in a timely manner. And of course, if you don't have a return on investment, you won't stay in business too long.

Another point would be that the measurement technology and data probably would not have the required credibility with the market participants if it were developed by an institution that was not perceived to be technically competent or at least competitively neutral. So, I think those are good points, that the Bureau has those capabilities now. Certainly, when there are marketplace disputes, I think it's only a government laboratory like the NBS that can act as a neutral third party in such disputes.

And finally, the National Bureau of Standards now has many formal measurement reciprocity agreements with other countries' national standardizing labs, and of course this is done in an effort to reduce nontariff trade barriers and enhance international competitiveness in the marketplace. And I wonder very seriously—if we had a private sector scheme in this country—whether other countries could actually enter into such agreements with either institutions or private companies or associations.

I would submit that privatizing the measurement and standards function of the National Bureau of Standards would be as disruptive to the overall marketplace and American economy as if we tried to disband the monetary system in this country. For instance, my dollar that I earn in California will buy a dollar's worth of goods here in Washington, DC, much the same way that a product that is designed in California, that is tested in California and whose measurements of its performance characteristics are traceable to the National Bureau of Standards, can be confidently sold here in Washington or any other East Coast state, or internationally. This, because of the recognized and accepted value for that performance.

I feel, therefore, that the federal government must stand behind its measurements and standards just as much as it must stand behind its dollar. And if you disbanded either the national measurement system or the national monetary system, yes, we could survive but there would be a serious loss of credibility. It would be disruptive to the marketplace, and we would lose a lot in the process, including—I think—a lot of public confidence in the system.

Senator Gorton. Thank you.

Mr. O'Grady, in your testimony you pointed out that the cold neutron research facility would really lead to major progress in materials sciences and engineering. What industries, what kinds of organizations, would benefit most from that?

Mr. O'Grady. It's hard for me to be very specific, Mr. Chairman, about what industries would benefit, but clearly in all of the materials aspects, of especially the newer materials where a cold neutron bombardment facility could generate additional data as to how well these materials could survive under varying conditions, would enhance the data base by which the ASTM technical committees on metals, both ferrous and nonferrous metals, likely in other committees, perhaps some of the committees on plastics and rubber, may very well—I'm sure would derive additional benefits.

In ASTM all the major industries of the United States are represented on one committee or another. Some of them are represented on a number of committees. And they all have the same interest in being in ASTM, and that is to produce documents, either specifications or test methods or something like that, which are useful to them in their marketplace.

And, anything that the Bureau can do to enhance the basic data base of knowledge on materials would be an enormous step forward for the American industrial complex. So, while I regret I cannot specifically tell you what industries, I would certainly think that the iron and basic metals industries and some of the composite groups would surely benefit from such a facility.

Senator Gorton. Thank you.

Mr. Collins, if ICST were eliminated, could industry take on many of the Institute's functions through cooperative projects similar to the Corporation for Open Systems? That, of course, was the message we were getting from the administration witnesses. I'd like to hear your side on that.

Mr. Collins. I think a succinct answer is no. It could not take it on as effectively because there is no entity nor association that would have the same credibility or would elicit the same trust from the industrial components as the ICST does.

I think that's the simplest answer to your question. Is that deep enough?

Senator Gorton. Well, I think it's going to have to do for now.

I'd like Mr. Epling to give me the same answer with respect to the two centers. Is there really a potential for states and private entities to perform the functions of those two centers?

Mr. Epling. I think it's very unlikely, sir, quite frankly. The construction industry is huge. It's historically about 10 percent of our economy; but again quite candidly, of all of the sectors of our economy it is the least funded in research and development by a considerable margin compared to all others from agriculture, through aerospace, automation, whatever.

Very limited total funds are invested in building research and technology and construction products, and so it is almost certain that it would just create a gap that would not be filled.

Senator GORTON. I want to thank the four of you for coming today. As was the case last year and the year before, I have found the relationship between these agencies and the private sector to be particularly intriguing and particularly productive.

I'm sorry that we've run out of time. For each of you, I had several more questions and I will submit those questions to you in writing. Your contributions are greatly appreciated.

With that, the meeting is adjourned.

[Whereupon, at 11:52 o'clock, a.m., the hearing in the above-entitled matter was adjourned.]

ADDITIONAL ARTICLES, LETTERS, AND STATEMENTS

Statement of Vico E. Henriques, President, the Computer Business Equipment Manufacturers Association

The Computer and Business Equipment Manufacturers Association respectfully submits herewith its views on the program and funding of the Institute for Computer Sciences and Technology (ICST) of the National Bureau of Standards (NBS).

CBEMA is the national trade association of manufacturers and assemblers of information processing, business and communications products, supplies and services. Its 38 member companies had combined sales of more than $135 billion in 1984. They employ more than 1.6 million people worldwide.

CBEMA is deeply concerned about and strongly opposes the 50% reduction in FY 87 funding of the Institute for Computer Sciences and Technology (ICST) of the National Bureau of Standards (NBS).

We regard ICST as a critical national resource for focusing the Government agencies' requirements and representing these requirements in arenas where national and international standards are developed.

ICST performs a valuable service and we support its continuing mission which includes:

Serving to improve productivity through cost-effective use of the Government's $15 billion annual expenditures for computers and communications technology.

Recommending Federal Information Processing Standards.

Assisting in implementation of systems that help migration in the government to new standards, as with the current Department of Defense gateway program.

Performing basic research in networking and testing technology which is valuable as a national and international resource.

Sponsoring workshops and OSINET—a globally distributed digital data network for research on Open Systems Interconnection—to provide an open forum to demonstrate the use of international standard products.

We believe that any reduction in the funding of ICST would seriously affect the Institute's ability to fulfill its responsibilities to the Government. It would also reduce, if not eliminate, the key role it has been playing in the development of consensus standards for computer communication interfaces and measurement techniques for testing computer protocol performance, and seriously impair its ability to work with industry.

As a part of the National Bureau of Standards, ICST is uniquely situated to be an effective, impartial negotiator in the standards development process. It promotes voluntary international standards that preserve U.S. industry's competitive positions in the world market, while supporting users' needs for standards to achieve increased productivity and delivery of services at reduced cost.

Its continued development of software test procedures, media testing, computer graphics and security is a unique and valuable service to government and industry.

Examples of ICST's unique role are:

(1) Testing and certification of magnetic surfaces to assure that when a product is received it will work in a computer system. The work ICST has done in the development of standard reference materials for magnetic media (e.g., tapes, disks) is highly significant to the quality of American products around the world.

(2) Development of the Data Encryption Standard, DES, which provides for security in data communications in non-defense applications. ICST drew together the interested parties in the industry and produced the standard that is accepted now as a world-wide standard for data encryption.

(3) Development of network protocols and test methods. ICST has been playing a major role in the development of consensus standards for computer com-

munication network interfaces and measurement techniques for testing computer protocol performance. This work will assure that computer products of different manufacturers will work together using international standards.

(4) Development of the information resource directory system (IRDS) standard. ICST drew together users and suppliers of IRDS software and produced the technical specifications which provided the basis for the proposed national and international standard for this important class of computer software system. ICST is currently working with industry to develop test procedures to support this standard.

ICST has been a major contributor to the voluntary standards development process. As the representative of the United States Government, the Institute represents one of the largest blocks of computing users in the world. Its participation helps to ensure that the necessary balance of interests in the standards development process is maintained.

The ICST program was established in 1965 under Public Law 89-306—the "Brooks Act"—to:

> Develop needed federal ADP standards; give technical guidance to government agencies; and perform necessary research.

The current program is addressing areas of major interest including:

> Office automation; languages and software development; database technology; computer graphics; computer networking; hardware interfacing; storage media, such as magnetic and optical disks; document interchange; security procedures and technology; artificial intelligence applications; and development of testing methods for emerging software standards.

Equally important to its role in voluntary standards development, is the informed leadership and guidance ICST has provided to the Government in these areas as well as informing and assisting the private sector. Work in each of these important areas would be severely reduced or eliminated under the proposed reduction.

ICST plays a unique and invaluable role in providing guidelines and standards to help the Government to improve productivity through the cost-effective use of the $15 billion annual federal expenditures for computers and communications technology. The pace of new technology is increasing so rapidly that this kind of help is essential. If this centralized help is eliminate, the other Government agencies will be left to establish their own guidelines and standards. This will cause the proliferation of widely varying technical specifications in procurements from separate agencies. The result will be greater expense, less effectiveness, and confusion in Government procurement of computers and related services and supplies as well as in the operation of the computers once received.

The work that ICST does in the continued development of software test procedures, media testing, computer graphics and security will be seriously hampered. These functions cannot be performed elsewhere.

Further, the proposed reduction in ICST's budget will undoubtedly eliminate the key role the Institute has been playing in the development of consensus standards for computer communication network interfaces and measurement techniques for testing computer protocol performance. ICST's work on test methods that supports the development and implementation of the computer network interface standards will assure that computer products of different manufacturers will work together using international standards. This work must continue if we are to maintain a viable economy and a viable contribution in the world marketplace. It serves the essential needs of preserving U.S. industry's competitive positions in the world maket while supporting Government and private sector users' needs for standards to achieve increased productivity and delivery of services at reduced cost.

An area that has often been overlooked is the help that the ICST can provide to the International Trade Administration of the Department of Commerce in rationalizing export control criteria. This is a significant value to our industry when we work with the Commerce Department, Department of Defense and the intelligence community in trying to achieve a rational set of export controls that will not hamper the export efforts of our industry, while maintaining our national security.

ICST is very important to America's productivity and its competitiveness with the rest of the world. Last year our industry contributed a positive balance of trade in the amount of $4.455 billion to the United States economy. That is in products only. We do not know quite yet how to measure the intangibles, as it were, in licensing and commerce in technology, but these would add significantly, perhaps as much as 50 percent more, to the positive balance of trade.

Rather than reducting its role, we would encourage the United States Government to seek a mechanism to formally recognize a wider role for ICST in promoting the interests of the computer and communications industry at the international level, and to increase the resources available to perform this role. With increased resources and stable federal funding, ICST will be better able to build increased cooperative efforts with industry.

In its budget submission for FY 1979, the OMB requested $17.9 million in total funding for ICST. That level of funding would have permitted ICST to develop a comprehensive program of needed standards and guidelines across the high priority areas (including networking) identified in its five-year plan. Congress approved a budget of $11.3 million for FY 1979. ICST's funding was reduced to $10 million in FY 1983 and has remained frozen at that level (slightly below in FY 1986).

ICST developed an effective program of work at the $11.3 million level of funding appropriate in FY 1979. An equivalent funding level, in current dollars, (approximately $15 million in FY 1987 dollars) would seem highly desirable for the good of both Government and international competitiveness.

Perhaps equally as important as level of funding is stability of funding. ICST will be better able to fulfill its responsibilities to the Government and to build cooperative, long term projects with industry if its budget is not in jeopardy every year.

ICST's funding level has placed severe constraints on the scope of its program. In spite of this, we believe the quality of the work ICST has been able to do has been very good and is a tribute to the professional competence and dedication of its personnel.

Given adequate resources, ICST could increase the scope of its efforts to more effectively address the areas of major interest noted above.

This is the fifth consecutive year that a drastic funding cut has been proposed for the ICST. Each time, the Congress has restored the proposed reduction, recognizing that no other private sector or governmental organization can adequately provide these critically needed services.

These proposed cuts create uncertainty about the future which must have a continuing negative effect on the morale of the ICST personnel. It is very difficult to retain qualified computer professionals, who are in such great demand in the private sector, or attract new ones if they don't see any future there. This situation not only affects the Institute's ability to fulfill its responsibilities to the Government, but it also impairs its ability to work with industry. To be effective, the personnel need a certain degree of stability in this regard. The United States Government cannot afford to waste the expertise and effectiveness it has built within the current ICST structure.

Regardless of whether ICST's role is expanded, America needs a strong standards program in the computer hardware interface, software and telecommunications (networking) technologies to maintain our competitiveness and world leadership in these areas. ICST has a key role to fulfill in supporting development of the needed standards and test methods.

Of primary importance, the work being done by ICST is vital to the cost-effective use of the Government's $15 billion annual expenditure for computers and communications products and services. An appropriation of $10 million to $15 million to more effectively utilize this expenditure would be money well spent even if we ignore the benefits to the private sector and our international posture.

CBEMA strongly urges that the ICST budget for FY 1987 be funded at least at the same level as FY 1986 to continue this essential program.

We appreciate the opportunity to submit CBEMA's views on this important matter and trust that they will receive your serious consideration.

Ross F. Meriwether & Associates, Inc.,
San Antonio, TX, February 3, 1986.

Hon. Slade Gorton,
Chairman, Senate Subcommittee on Science, Technology and Space, Senate Commerce, Science and Transportation Committee, Washington, DC:

I would like to provide some input for your consideration during your upcoming budget hearings related to NBS.

I have operated a consulting engineering business in the field of building energy system analysis for the last seventeen years. We did much of the early pioneering work in the development of analysis tools for computer modeling the energy performance of commercial and institutional buildings and the mechanical/electrical systems and plants that serve those buildings. Hence, it is with a combination of dismay and anger that I have watched the exorbitant funding over the years (first by ERDL, then by DOE) of the unnecessary, duplicative, and wasteful efforts at the various national labs (most notably Lawrence Berkley Labs) to develop, distribute, and support similar computer programs for building energy analysis in direct competition with the many such programs available from the private sector. Needless to say, I heartily endorse the concept of eliminating or greatly reducing such funding.

The problem, however, is that indiscriminate elimination or reduction of funding in the building energy field can be very detrimental to the continuing efforts to improve the energy performance of all buildings in the United States. The National Bureau of Standards, through its Center for Building Technology, was providing information of a constructive and supportive nature to those of us in this field long before there was an ERDL or a DOE. When Lawrence Berkley Labs was chosen as the lead lab for building energy activities, there was not one person in the newly created section that had any experience in the building/HVAC field. Much of the waste that has occurred in the building side of the energy field in the last 10 or 12 years was the result of reducing the direct funding of NBS(CBT) and routing that funding (and countless other millions) through LBL.

I realize that any serious efforts to significantly reduce government spending will necessitate establishing priorities among those programs and agencies that compete for similar funds. It is my hope that those programs at the Center for Building Technology which efficiently compliment private industry efforts in the building energy field will be recognized as more valuable than most of the related effort at the national labs.

Respectfully,

Ross F. Meriwhether, P.E.

Mineral Insulation Manufacturers Association,
Summit, NJ February 19, 1986.

Hon. Slade Gorton,
Chairman, Senate Subcommittee on Science, Technology and Space, Washington, DC.

Dear Senator Gorton: The Department of Commerce has again proposed the complete phasing out of the Center for Building Technology (CBT) within the National Bureau of Standards. The members of the Mineral Insulation Manufacturers' Association, Inc., (MIMA), whose names are listed below, believe that elimination of this center must not occur and that very possible effort should be made to preserve and continue the CBT with adequate funding. We wish to submit the following for the record.

The Center for Building Technology is our country's only non-proprietary laboratory which can supply the type of research and development that cannot be obtained from private sources but which can stimulate private sector research as a result of its findings. The Center for Building Technology is the rallying point on insulation products, insulation systems, and thermal testing between industry, NBS, other government agencies, ASTM, ASHRAE and others. It is inconceivable that Congress would consider leaving the United States as the only developed country without a national building research laboratory. This would be an irreplaceable loss to the building community, the nation, and the international research community.

Of particular importance to our industry in recent years is the provision by the Center for Building Technology of measured calibrated transfer specimens for use in conjunction with the "representative thickness" provisions of the Federal Trade Commission Rule, "Labeling and Advertising of Home Insulation", 16 CFR 460.6. Test data was generated by the 1000 mm line-heat source guarded hot plate; documentation was obtained regarding the test appropriateness and the theory of heat flow in thick insulations. MIMA provided a Research Associate to assist in this development at a cost of $50,000.

This program could not have been accomplished by private industry within the prescribed time limits. One insulation manufacturer with extensive research facilities invested in excess of $600,000 in 1976–78 in research and development directed toward implementation of full thickness testing. They concluded that they were still not confident that full thickness testing was mature.

The FTC urged by industry to defer its implementation of the full thickness testing section of its Rule until the NBS 1000 mm guarded hot plate and the related measured calibration transfer specimens were available. It was estimated that, in the fourteen months required to complete this development, manufacturers would be exposed to a rash of civic petitions for non-compliance with the test method than required by the FTC. This test method had already been determined by NBS CBT to be not feasible. Increased costs of industry for this immediate compliance, which would have had to be passed to the consumer, were estimated to be around $90 million for the fourteen month period.

Currently, the members of MIMA are cooperating with the staff of the Center for Building Technology on a research program to develop a method for measuring installed loose-fill insulation R-value. There is a growing concern throughout the United States that home owners may not always be having the correct amounts of insulation installed in their homes. The present state-of-the-art in measurement of installed insulation R-values is unsatisfactory. A more sophisticated and accurate procedure is not only desirable, but necessary. The expertise and facilities of the Center for Building Technology, as well as its non-proprietary nature, are necessary to achieve the desired results in the interests of the nation's home owners and of the nation's need to conserve energy. MIMA has pledged funds to be used to generate and analyze the initial data base for mineral fiber insulations.

Other activities by the Center for Building Technology of importance to the mineral fiber insulation industry:

(a) Thermal wall mass study: an independent evaluation to predict the effect of wall mass on energy use.

(b) Development of thermal test methods for building and insulating materials that will determine their thermal properties as required for cost-effective materials selection and building envelope design. (The Calibrated Hot Box).

(c) Development of techniques to assess the airtightness in houses.

(d) Development of diagnostic procedures, measurement techniques, and interpretation methods for in-situ assessment of the thermal integrity of building envelopes.

(e) MIMA was one of the instigators of the NVLAP program relating to insulating products. The Center for Building Technology's inspection of apparatus and standard testing procedures under the program is, again, an important non-proprietary contribution to the establishment of quality assurance for buildings.

(f) The activities of the Building Physics Division in the interest of energy conservation are too numerous for specific mention. This independent research, accomplished by no other organization, is of immeasurable help in providing industry with unique data.

(g) The Center for Building Technology is the major non-proprietary source of technical information for the development of voluntary standards for the thermal performance of buildings by the American Society for Testing and Materials, the American Society of Heating, Refrigerating and Air-Conditioning Engineers, and building code organizations.

MIMA appreciates the opportunity to submit its opinions to your committee. We urge that Congress restore appropriate funding to the Center for Building Technology. These elements within our nation's sole national building research laboratory must continue to work on R&D projects to provide the information needed by Federal Agencies interested in building and to provide technology that private industry alone cannot provide.

Thank yor for considering our views.

Sincerely yours,

SHELDON H. CADY, *Executive Vice President.*

AMERICAN CONCRETE INSTITUTE
Detroit, MI, March 5, 1986.

Hon. SLADE GORTON,
Senate Subcommittee on Science, Technology and Space, Washington, DC.

DEAR SENATOR GORTON: We understand that the proposed fiscal 1987 Federal budget once again eliminates funds for the Center for Building Technology (CBT) and its programs. The American Concrete Institute, through its Executive Committee, wrote you last year regarding the continuation of the Center and the Committee has agreed to resubmit our comments and to support the reauthorization of CBT.

In general, we stand behind the efforts being made by Congress and the Administration to bring the nation's debt load under control by reducing the cost of Government. However, elimination of the Center and its activities would result in a greater cost to the nation than the savings realized. In the Committee's opinion, CBT provides research capabilities and perspectives which would be difficult to duplicate in the private sector.

For background, the American Concrete Institute is a nonprofit, technical society whose purpose is to further engineering and technical education and scientific research on concrete. ACI is a voluntary consensus standards-developing organization and publishes standards on concrete design and construction using procedures approved by the American National Standards Institute (ANSI). We are an individual membership society of almost 20,000 members and membership is open to anyone interested in the design, construction or use of concrete.

The Center for Building Technology has been of great help to ACI in achieving our purpose. For instance, representatives of the Center serve on our important technical committees such as Committee 318—Standard Building Code, and Committee 228—Non-destructive Testing. Technical information developed by the Center is thus input directly into the committees that produce our various standards and technical materials. Without this input the work of the American Concrete Institute would be impaired. Both industry and the consumer would suffer. The construction industry is very large (almost ten percent of Gross National Product), but by its very nature the construction community is fragmented. It is unrealistic to expect that industry would fill the gap which would be created by the discontinuance of these Center for Building Technology activities.

The National Bureau of Standards programs dealing with buildings are the only integrated programs in the nation able to deal with complex technical issues affecting the entire building industry. These programs make major contributions to reducing the burden of unnecessary and ineffective building regulations while maintaining essential levels of safety. The elimination of these programs would leave the United States as probably the only developed country in the world without a national building research laboratory.

We wish to be recorded as endorsing the reauthorization of the Center for Building Technology and its programs. We also hope that the Administration and Congress can develop a permanent solution to the funding problems for the Center so that its continuity will be insured. In our opinion the Center is engaged in important research and developmental projects that result in the increased economy and safety of structures.

Very truly yours,

George F. Leyh, *Executive Vice President.*

International Association of Fire Chiefs, Inc.,
Washington, DC, March 24, 1986.

Hon. Slade Gorton,
Chairman, Science, Technology and Space Subcommittee, Senate Committee on Commerce, Science and Transportation, Washington, DC.

Dear Senator Gorton: During your February hearing on the reauthorization of funding for the U.S. Fire Administration and National Fire Academy, the International Association of Fire Chiefs took the opportunity to speak in support of the Center for Fire Research at the National Bureau of Standards.

In view of your upcoming April 9 hearing on the reauthorization of funding for the National Bureau of Standards, the IAFC wants to reiterate and emphasize its unequivocal support for the Center for Fire Research.

The center is an internationally respected scientific research facility. The elimination of the center would destroy the only federal scientific body that has aggressively researched and analyzed the chemistry and physics of fire. This pioneering effort has led to a fundamental understanding of the nature of combustion and the development of fire-resistant materials and building techniques.

It is also worth pointing out that the Center for Fire Research was primarily responsible for developing the technology that led to the smoke detector and the quick-response sprinkler . . . two technologies that the fire administration and fire academy are using to promote improved fire safety across the country.

In fact, the smoke detector is a good example of the flow of technology and information from the center to the fire administration and fire academy to the public. The center developed the technology; the fire administration and fire academy promoted the use of smoke detectors; and now, an estimated 67% of all dwelling units in this country have smoke detectors.

Finally, elimination of the Center for Fire Research would leave the United States as the only industrialized nation without a central, federal fire research facility . . . an embarrassment in light of the fact that the U.S. has one of the worst fire records of any of the industrialized nations.

Senator Gorton, the International Association of Fire Chiefs strongly urges reauthorization of funding for the Center for Fire Research. We urge a level of funding in fiscal year 1987 equal to the Center's post-Gramm/Rudman/Hollings fiscal 1986 funding, with an inflation factor.

We request that this letter be made a part of the official record of your April 10 hearing on the reauthorization of funding for the National Bureau of Standards.

If you have any questions or need additional information, please do not hesitate to contact us.

Thank you for your assistance and support.

Sincerely,

COLIN A. CAMPBELL,
Associate Executive Director.

PORTLAND CEMENT ASSOCIATION,
Skokie, IL, April 8, 1986.

Hon. SLADE GORTON,
Chairman, Subcommittee on Science, Technology and Space, U.S. Senate, Washington, DC.

DEAR MR. CHAIRMAN: The Portland Cement Association is the research, promotional and public affairs arm of the cement industry, representing approximately 56% of U.S. cement production capacity.

We wish to express support for FY 1987 funding for the Center for Building Technology (CBT) and the Center for Fire Research (CFR) within the National Bureau of Standards. In this regard, the Association encourages federal support of activities of the National Bureau of Standards that are acknowledged to serve the interests of the public but which the cement industry itself, or others in the private sector, find difficult to justify financially. Partial financial support by NBS of the Cement and Concrete Reference Laboratory is an example of this kind of effort. The CCRL is supported both by NBS and by funds provided by the American Society for Testing and Materials (ASTM), and provides a nationwide inspection service for laboratories that test materials used in all types of concrete construction. Results of these inspections include an improvement in the quality of services provided by participating laboratories and consequent better construction by the general public.

In general, the Portland Cement Association favors creation of incentives that will encourage maximum use of private funds for technological development related to the use of cement and concrete. We believe that federal funds should not be used to duplicate activities for which organizations and qualified personnel already exist in the private sector. To assure proper identification of projects that cannot be carried out by the cement and concrete industries, we believe that selection and implementation of federally supported research and test programs should be made only after study by knowledgeable representatives of both the public and private sectors. In a limited way, this kind of input is already being made by the National Institute of Building Sciences. Once programs are undertaken by organizations such as NBS, these should be permitted frequent review and, if necessary, modification to assure ultimate acceptance and use of results by both the public and private sectors.

We are aware, of course, of the provisions of the Gramm, Rudman, Hollings Act and its implications with respect to agencies such as NBS. However, we ask that special consideration be given to the effect that a budget reduction would have on the services supplied by this highly respected agency. We feel it is imperative that NBS operations be allowed to continue to serve those sectors of the economy which rely on this expertise.

Respectfully submitted.

JOHN P. GLEASON, Jr., *President.*

NATIONAL CONFERENCE OF STANDARDS LABORATORIES,
April 15, 1986.

Senator SLADE GORTON,
Chairman, Subcommittee on Science, Technology and Space, Committee on Science and Transportation, Washington, DC.

DEAR SENATOR GORTON: As the Immediate Past President of the National Conference of Standard Laboratories, I am providing you some additional comments and observations concerning the plight of the National Bureau of Standards that—because of time constraints—I was unable to make last week during your formal subcommittee Authorization Hearings on the FY87 Bureau budget.

I would like to expand on a point I addressed briefly in our written statement. It is important to understand that the Bureau—like most industrial companies—has two distinct internal cultural factions. The first is the science research faction (sometimes referred to as the 'ivory-tower group') that normally receives high corporate, public and political visibility and the second—the engineering faction—which attempts to focus its efforts on the customer and the users who are the beneficiaries of that technology and scientific research data. What we find is that the latter faction must often compete with the former for adequate funding. It is however, the latter engineering faction that transfers the technology for the betterment of our economy and American public. I want to emphasize to you, Mr. Chairman, and the rest of your subcommittee and their respective staffs, that it is important to be aware of this imbalance in public and political visibility as you deliberate MBS funding requirements.

For example, this same visibility imbalance has probably contributed—in no small way—to the preception that the Bureau has developed into a National Job Shop. It appears to many of us in the measurement science field that this country has lost sight of the original purpose for the creation of the Bureau. Namely, the support of American industry's measurement and standards needs. These requirements include the custodial responsibilities as well as the equally important R&D efforts for new measurement standards and services to support emerging industrial technologies.

A second point I would like to bring to your attention, Mr. Chairman, is that many of my colleagues and I perceive NBS' primary—and appropriate—contribution to America's economy is to leverage the productivity and the quality of industry's technology-based activity. Improved measurement practices can—and often do—exert tremendous leverage in today's high-tech economy. Measurement technologies, standards, data and calibration services make industrial R&D more productive by making it easier for industrial scientist and engineers to transfer or transition general engineering and technical principles into new processes and new product technologies.

A very important example of this type leverage can be cited in the emerging technology areas where adequate national traceable standards often do not exist. Industry must therefore substantially over-design and over-test its products in an effort to assure performance specifications. For a country—such as ours—that does not enjoy low labor rates, this added cost burden certainly inhibits further our competitive position as well as our ability to penetrate both domestic and international markets.

My final point is in regards to "privatizing" the Bureau's measurement standards function. Let me re-emphasize my stated position that traveling down such a road would be very risky and expensive as well as extremely disruptive to the marketplace and the overall economy. As a Nation, we cannot permit—nor can we afford—any erosion of public confidence in the U.S. National Measurement System that most assuredly would result if such policies are pursued by this government.

Virtually all other industrialized countries have strong government-supported and subsidized standards bureaus. I believe it is absolutely essential that this country have in place a federally supported—and funded—national standards laboratory which is not only recognized as a credible institution, but also one that is competitively neutral. I believe it equally important that we have a cohesive and coherent U.S. National Measurement System made up of private sector laboratories whose actions and procedures can be guided by—and reference to—that federal facility. I further submit that national measurement standards must also be a conscious element of this nation's industrial growth policy.

Accordingly, I would urge this government to forget about privatizing NBS' measurement standards functions. I would earnestly advocate instead that this government vigorously support the Bureau and provide it with the necessary federal funds to ensure its present and future capacity and capability to fulfill its congressionally mandated missions and responsibilities.

In conclusion, and on behalf of the industrial membership of the NCSL, I wish to express our deep appreciation for your past interest in and support of the Bureau and the National Measurement System. I respectively request that this letter and the previously submitted support data on the six Process and Quality Control proposals be made a part of your committee's records.

Sincerely,

PETE ENGLAND, *Past President.*

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